Constructing Morale, Welfare, and Recreation Facilities

Making a Good Project Delivery System Better

AR304R1

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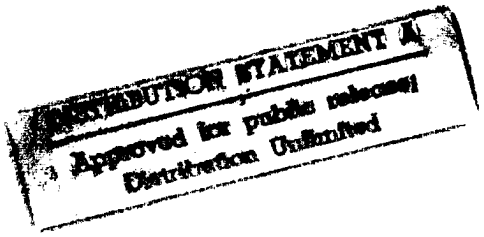

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The Army's Community and Family Support Center (CFSC) acts as the construction agent for the service's morale, welfare, and recreation (MWR) program which provides soldiers and their families with recreation, community services, and social activities that enhance their quality of life and promote morale.

In the past five years, the funding levels of nonappropriated funds (NAF) — the primary source of funding for the construction and renovation of MWR facilities — have varied dramatically but thus far have been sufficient to meet the requirements for valid projects. Now, however, because of shrinking forces, base closures, and reduced revenues from MWR business operations, it is more important than ever to make sure that available resources are spent wisely, i.e., identifying the Army's highest priority projects early in the process, funding only those projects, and delivering them expediently and with minimum staff support.

To help CFSC accomplish these goals, we recommend that CFSC take the following specific actions: Establish a business partnership with one or two U.S. Army Corps of Engineers districts for all engineering, design, and construction services beyond CFSC's in-house capabilities so as to improve the quality of services delivered by the Corps. Develop and implement a new policy for allocating project funding among the major Army commands (MACOMs), i.e., assign funding ceilings to all of the MACOMs. Modify the conduct of the CRB meeting so that only projects that have already been prioritized (using the recommended prioritization matrix) by the MACOMs and are within their funding ceiling are briefed to the CRB members. Streamline and automate, where practical, the program delivery process. In particular, automate the funds certification process.

Army soldiers and their families have come to depend on CFSC to deliver the MWR facilities and services that satisfy their lifestyle expectations no matter where they are stationed. The anticipated decline of NAF major construction resources could put this standard in jeopardy, but by adopting the above recommendations, CFSC can ensure that needed MWR facilities will continue to be delivered on time, within budget, and cost-effectively.

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Nonappropriated funds major construction (NAFMC), Community and Family Support Center (CFSC), Morale, welfare, and recreation (MWR), Construction Review Board (CRB), Project Validation Assessment (PVA), activity-based costing (ABC), ICAM definitional language (IDEF) modeling

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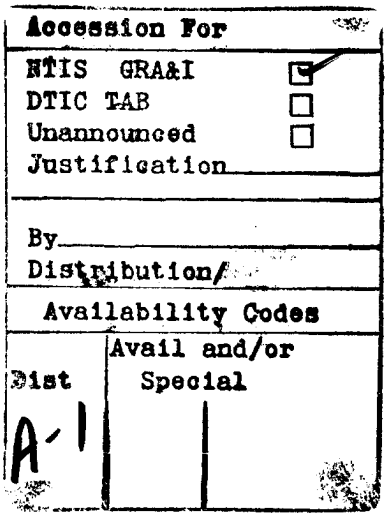

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Constructing Morale, Welfare, and Recreation Facilities:
Making a Good Project Delivery System Better

Executive Summary

The Army's Community and Family Support Center (CFSC) is responsible for overseeing morale, welfare, and recreation (MWR) programs at Army installations worldwide. These programs provide soldiers and their families with recreation, community services, and social activities that enhance their quality of life and help promote morale. As part of this responsibility for oversight, CFSC directs the development of the nonappropriated funds major construction (NAFMC) program. This program involves the construction of new and renovation of existing MWR facilities.

In years past, funding for the NAFMC program was quite abundant due to high revenue levels from the Army, Air Force Exchange Service (AAFES) — the single largest source of NAFMC funds. Today, however, funding has become increasingly restricted due to reductions in AAFES revenues and appropriated fund support, base closures, force reductions, and reduced revenues in MWR business operations. It is for these reasons that it is more important than ever that the Army ensure it is identifying only the highest priority projects for development, fund only those projects, and deliver them expediently and with minimum staff effort.

Although CFSC delivers facilities faster and more efficiently than other military construction agents, the uncertainty in future funding levels and project requirements necessitates fundamental changes in its project delivery process. We recommend that CFSC take the following specific actions to further improve its current project delivery system:

- *Establish a business partnership with one or two U.S. Army Corps of Engineers districts for all engineering, design, and construction services beyond CFSC's in-house capabilities.* A new working agreement with USACE would provide a mechanism for lowering project delivery costs and could give CFSC the influence it needs to improve responsiveness and quality. A memorandum of agreement should clearly identify CFSC's expectations and the district's responsibility for responsiveness, accuracy and price of estimates, design and construction management rates, and other administrative requirements. Working with its new business partner, CFSC should establish rates that are reasonable for both USACE and CFSC. The agreement should also reduce the number of cost categories reported by USACE and tracked by CFSC to simplify financial tracking during project construction, thus reducing CFSC staff support.

- *Develop and implement a new policy for allocating project funding among the major Army commands (MACOMs).* The time, effort, and money spent during program development can be minimized by simplifying the current process. Identifying the next year's MWR program allocations for each MACOM during the Construction Review Board (CRB) meeting will permit MACOMs to establish their priorities within their funding limitations early in the process and thus reduce the number of MWR projects being considered. Once this happens, only a fraction of the MACOMs' total requirements will be proposed, staff support will be reduced and less money will be spent on project validation assessment, particularly on those projects that have little chance of being funded. To ensure that the Army's highest priorities are being considered, CFSC should develop, and have the MACOMs and the CRB begin using, a project prioritization methodology.

- *Modify the format, timing, composition, and conduct of the CRB meeting.* CFSC should modify the conduct of the CRB meeting to make it more responsive to the new business climate. Only projects that have already been prioritized by the MACOMs and are within their funding caps should be briefed to the CRB. The CRB would then vote only on the MACOMs' short list of projects and extraordinary funding concerns. Additionally, the CRB meeting should be scheduled closer to the congressional approval cycle to minimize disruption and changes to the final CRB-approved program. While changes to the program will always be a political reality, including a representative from Army staff as a voting member of the team could reduce changes to the recommended NAF major construction program.

- *Streamline and automate, where practical, the program delivery process.* CFSC already delivers projects expeditiously; it will be challenging to reduce that time much more. However, CFSC can shave some time from the overall process and cut back the total amount of staff and external effort needed to develop and execute the program by eliminating certain redundant and non-value-added activities and automating other selected activities. For example, certain review and approval steps can be modified or eliminated, fund certifications can be simplified and automated, and documentation can be made easier for users to prepare and CFSC to review. CFSC should also assume responsibility for, and automate the development of, the NAF Greenbook. Finally, CFSC should develop and begin using an automated project management system to enable CFSC's staff to meet the ambitious proposed project delivery timeline.

Army soldiers and their families have come to depend on CFSC to deliver the MWR facilities and services that satisfy their lifestyle expectations no matter where they are stationed. The anticipated decline of NAF major construction resources could put this standard in jeopardy, but by adopting the above recommendations, CFSC can ensure that needed MWR facilities will continue to be delivered on time, within budget, and cost-effectively.

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CHAPTER 1

Introduction

BACKGROUND

The well-being and morale of Army soldiers are as important as the training they receive when it comes to readiness and retention of quality personnel. Consequently, the Army's morale, welfare, and recreation (MWR) program was established to give soldiers and their families a quality of life that is comparable to that found in civilian communities. No matter where they are stationed, MWR activities enrich the soldiers' lifestyle, provide first-class living and working environments, support Army communities of excellence, and enhance their sense of community. In support of those activities, the MWR program delivers a wide range of social, family support, recreational, and educational services such as bowling centers, clubs, golf courses, recreation centers, and guest houses.

The overall responsibility for the MWR program rests with the Army Community and Family Support Center (CFSC). CFSC establishes MWR program policy, oversees the operations and maintenance of existing activities, and manages the major construction program to ensure that new facilities are constructed when and where they are needed most and that renovations to existing facilities are performed when necessary. Constructing the right facilities on schedule and within a reasonable cost is a major factor influencing the success of the Army's MWR program.

The nonappropriated funds (NAF) that support the MWR program, including major construction (NAFMC) and renovations, are generated from money that soldiers and their families spend on MWR activities and other support services. Because the MWR program is intended to be mostly self-sustaining, those resources are used to plan, program, design, and construct the facilities to sustain and expand the MWR program. In the past, those NAF revenues were more than sufficient to support the overall program. As recently as FY90, funding for the NAFMC program exceeded $120 million. At the time, revenues from Army and Air Force Exchange Service (AAFES) — the single largest source of NAFMC funds — were at an all-time high, as were the appropriated funds (APF) to operate and maintain existing MWR facilities.

Today, the NAFMC program is confronting an environment quite different from that in the past. Because NAFMC is funded by the sales of MWR services, the combination of declining military populations and shrinking MWR profits has reduced the funds available for NAFMC. The reduction in Army personnel around the world has significantly diminished the MWR business base and has resulted in decreased AAFES revenues. In addition, mediocre MWR business performance has also reduced the contribution to the funds available for

NAFMC projects. Consequently, the FY94 NAFMC program is funded at just $60 million, and funding levels for NAFMC programs in the near future are not likely to exceed $37 million per year. While NAFMC resources are shrinking, the cost of delivering NAFMC projects is on the rise, making it increasingly difficult to construct all the new facilities that are needed to maintain today's quality of life on Army bases. Because of the difficult business environment, it will become more important than ever for CFSC to make sure that the right NAFMC program mix is established, that only high-quality MWR projects meeting program objectives are approved, and that the facilities that get approved are delivered on time and at a reasonable cost.

So that it will be prepared to meet those new challenges, CFSC's Construction Directorate (CFSC-CO) asked the Logistics Management Institute (LMI) to identify deficiencies in and recommend ways to improve the processes that CFSC uses to identify, evaluate, approve, and execute NAFMC projects. We were specifically tasked to answer the following questions: Are the current project delivery processes effective? Can the overall project delivery costs be reduced? Are there more effective ways to program NAFMC, evaluate business performance before projects are approved and constructed, identify projects with the highest probability of success before any project development funding is spent, estimate project costs, and prioritize and approve the NAFMC program? Those issues were the focus of our study and are addressed in this report.

Overview of the Military Construction Process

Most DoD facility projects are delivered through the military construction (MILCON) process by agencies such as the U.S. Army Corps of Engineers (USACE) and the Naval Facilities Engineering Command. In the traditional MILCON project delivery process, the design-bid-construct approach is used in which projects are identified, programmed, approved by Congress, and then designed to 35 percent completion so that realistic facility cost estimates can be created. At that point, Congress reassesses the project based on its expected cost before it approves funding for final design and construction. When the traditional MILCON process is used, the total time required, beginning with identification of the need for a project and ending with occupation of the facility by the owner, often exceeds seven years.

However, the CFSC is not required to follow the traditional MILCON project delivery process. Because the MWR program is expected to be self-sustaining, Congress permits CFSC to manage NAFMC in a more businesslike manner. Some of the major features of the NAFMC process are as follows:

- Commercial construction standards and criteria are permitted in lieu of military or Federal design and construction specifications (although Federal life safety and fire specifications typically are used).

- Specific NAFMC projects are approved as part of a fiscal year program by the Army Board of Directors (BOD); Congress simply authorizes the construction expenditures.

- NAFMC projects may be delivered using innovative approaches such as design-build, an approach in which a single contractor both designs and builds the project, instead of using the traditional MILCON approach.

- In contrast to APF, funding for NAFMC projects does not expire.

- The Federal Acquisition Regulation (FAR) does not apply to the procurement of an architect-engineer (A-E), construction, or other service contractors, which relieves CFSC from meeting the requirements of Small Business Set Asides, Competition in Contracting Act, and the Contracts Dispute Act. Consequently, CFSC can use competitive negotiations rather than low bid. (While CFSC is not required to follow the Brooks Act, it uses its procedures when appropriate.)

- The NAFMC projects must follow the procurement procedures outlined in Army Regulation 215-4, *Moral, Welfare, and Recreation Nonappropriated Fund Contracting*.

Because delivering NAFMC is different than MILCON, CFSC prefers to manage the design and construction of the projects using its in-house resources and the design-build approach. However, some work is beyond its in-house capabilities, so CFSC has USACE manage the design and construction of selected NAFMC projects.

Study Approach

While the cognizant personnel in CFSC have an excellent grasp of the processes and procedures for delivering NAFMC projects, what they inherently know and understand is not well documented. We found no existing activity models or process networks and very little statistical and cost data upon which we could base our analysis. Therefore, before we could assess the current process and recommend ways to improve project delivery, we needed to develop a comprehensive model of the existing NAFMC project delivery process to illustrate the relationships among important NAFMC activities, approximate the activity durations and project life cycle, and estimate in-house level of effort and costs in support of the NAFMC construction program.

To aid in the evaluation of the current NAFMC delivery process and the development of an improved or "to be" delivery process, LMI assembled a process action team (PAT) comprising all the major participants in the NAFMC delivery process, both internal and external to CFSC. The team included members from all CFSC directorates involved in the NAFMC delivery process as well as representatives from USACE, the Assistant Secretary of the Army (Installations, Logistics, and Environment) [ASA(IL&E)], and the major Army commands

(MACOMs). The team participated in various process modeling workshops and was instrumental in helping LMI understand and assess the current NAFMC delivery process and identify ways in which it could be improved.

With the support of the CFSC PAT, we used three business process modeling tools to diagram the way NAFMC projects are delivered today, from the identification of the need for a project through project closeout:

- *IDEF*[1] *activity models.* IDEF activity modeling techniques have been designed to capture business processes effectively, diagram those processes, and improve the communication between the process owners and the modeler.

- *Critical path method charts.* CPM activity modeling [sometimes called Program Evaluation and Review Technique (PERT)] is commonly used to represent the relationship among and duration of business process activities. Using the activity dependencies and durations, the CPM technique calculates business process cycle times and the critical path (those interdependent activities in the overall process that, if delayed, would cause an associated delay to the overall project).

- *Activity-based costing.* ABC is a cost accounting technique that can be used to assign staff resources and other costs to the activities in a business process. ABC helps us to better understand the actual costs associated with specific process outputs and is extremely valuable in identifying those high-cost activities with the greatest potential for delivering cost savings.

- *Value analysis.* Value analysis categorizes activities into two groups: those that add value to the end product or service and those that do not. Activities that do not add value are further divided into those that are necessary and those that are not. Value analysis can determine how much of an organization's resources are being expended on activities that do not add value to delivering a product or service and helps to identify reengineering and process improvement opportunities.

Used together, the four modeling tools provided us a detailed representation of the current NAFMC project delivery process. The results were validated through various reviews by CFSC and proponents of the NAFMC program. In addition to documenting the significant processes, the tools enhanced communications between the users and LMI concerning the processes. More detailed information concerning each of the modeling techniques can be found in Appendix A.

Given the information generated from the tools above, LMI and the CFSC PAT were able to identify process deficiencies and recommend actions to improve the process. For example, we looked at those activities that add value to determine if they could be simplified, automated, or integrated with another

[1]IDEF is an acronym derived from ICAM (which stands for Integrated Computer-Aided Manufacturing) DEFinition language.

activity. We examined non-value-added but necessary activities to determine if they could be reduced or simplified or if the policies that justify them could be changed to reduce their impact on staff effort. Clearly, any unnecessary non-value-added activities were prime candidates for elimination or major modification. The result of our assessment was a list of specific recommendations that, if implemented, could significantly improve the current NAFMC process by reducing process cycle time and staff effort without sacrificing CFSC's commitment to high-quality construction projects. As a final step, we generated an activity model of the "to be" NAFMC project delivery process that incorporates all of our recommendations.

REPORT ORGANIZATION

The following chapters in this report present the results of our analysis of the activity and cost models as well as our qualitative assessment of the major issues. Our conclusions and our specific recommendations follow that analysis. Specifically, Chapter 2 presents our findings concerning the overall NAFMC program, including a description of CFSC organizational elements responsible for program and project management, present and future NAFMC program requirements, sources of NAFMC funds, and present and future funding levels designated for the NAFMC program. In Chapter 3, we describe the various methods of project execution available to CFSC-CO; illustrate the basic elements of the typical NAFMC project life cycle; compare those elements to those used by other Federal agencies; and present information concerning project identification and prioritization, development of cost estimates, review and approval of proposed projects, and project execution, among other activities. Deficiencies and opportunities for improving the current system are also introduced in that chapter. Chapter 4 presents our conclusions and recommendations, as well as a strategy for improving the NAFMC project delivery process. Appendix A describes our modeling methodology in more detail. Appendices B through D, respectively, contain the detailed activity model, the ABC worksheet, and the project execution process timelines for the current NAFMC project delivery system. Appendices E and F present the activity model and project execution process timelines and flow charts for the proposed delivery system. Appendix G presents a suggested prioritization matrix complete with factor weights. Finally, Appendix H presents a detailed assessment of the accuracy of previous cost estimates developed by outside contractors and USACE.

CHAPTER 2

NAFMC Program Overview

The Army's MWR program was established to raise the quality of life on Army installations worldwide and thus attract and retain quality personnel. An equally important goal of the MWR program is to improve force readiness by promoting physical, mental, and emotional fitness. To meet those goals, the Army's MWR program uses some APF and the soldiers' own money (through subsidies on other NAF goods and services) to provide a variety of community, soldier, and family support activities and services. The MWR activities are classified by category based on mission significance, recreational value, and capability to generate self-sustaining revenues:

- Category A, mission sustaining activities, includes all activities considered essential in meeting the Army's military mission needs. Physical fitness centers, recreation centers, sport and athletic facilities, and libraries are examples of category A activities. Category A activities have virtually no capability to generate revenues and are therefore constructed and supported almost exclusively with APF.

- Category B, basic community support activities, includes activities intended to satisfy the basic physiological and intellectual needs of the soldiers and their families and thus create a baseline standard of living comparable to the private community at large. For example, outdoor recreation, child development centers, arts and crafts shops, automotive shops, and youth activity programs are all category B activities. Category B activities have some potential to generate revenues and may obtain some NAF resources for constructing new activities.

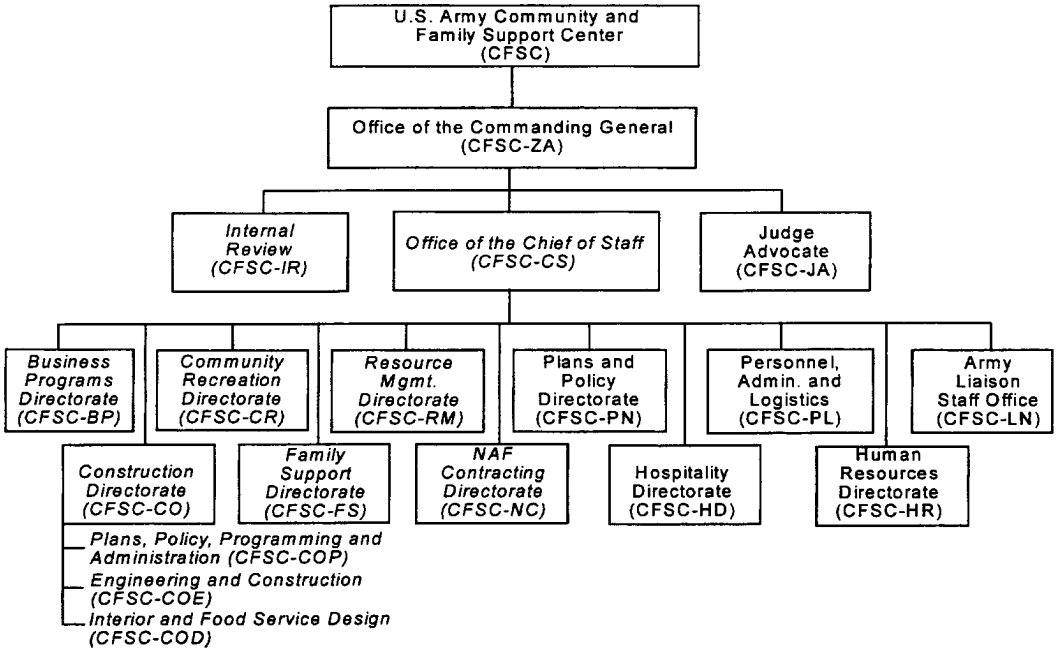
- Category C, enhanced community support activities, includes activities that are purely recreational and contribute to the military mission by improving morale. Those activities include bowling centers (exceeding 12 lanes), marinas, golf courses, and clubs. Category C activities typically are considered self-sustaining business enterprises and consequently receive little APF support. The construction of new category C facilities is funded almost entirely with NAF resources.

The Army's MWR program is big business with physical assets exceeding $1 billion. The mix and type of MWR services provided at each installation are determined by comparing the needs of the soldiers and their families to the availability of the required services on the installation and nearby private communities. MWR needs are satisfied by expanding or initiating new services, which often requires the construction of new facilities or major renovations to existing facilities.

This chapter describes the CFSC organizations responsible for overseeing the MWR program and for delivering NAFMC projects. In addition, this chapter describes the types and availability of NAF resources for major construction today and into the future. It also profiles the program in terms of new construction versus renovation and domestic versus overseas projects.

NAFMC Program Management Responsibilities

At the base level, the installation's Directorate of Personnel and Community Activities (DPCA) and the MACOM's Community and Family Activities Division are responsible for identifying MWR needs and business opportunities and for how local MWR activities are operated. In some cases, installations and MACOMs may use their own MWR resources to fund major construction for projects with high local interest but that will not compete successfully for Army NAFMC resources. CFSC, as the program manager for the Army's MWR program, is responsible for managing and administering those same MWR activities as a consolidated program to ensure that the Army meets its MWR program goals and the needs of the soldiers and their families. However, CFSC is not a direct command entity and, therefore, has little legitimate authority to dictate program development without consent and approval from the cognizant MACOMs and DPCAs. Figure 2-1 shows CFSC's overall organization and highlights those elements responsible for executing NAFMC.



Note: Elements in italics have some NAFMC responsibility.

Figure 2-1.
CFSC Organization and NAFMC Support Structure

Within CFSC, overall program management for the NAFMC program rests with the CFSC-CO, which formulates the policy, NAFMC programs, and guidance for all MWR facility construction. Its functions include

- overall management and oversight of the NAFMC programs,
- engineering and construction support to the MACOMs and installations for approved and funded NAFMC projects,
- interior design support for MWR activities at installations, and
- provision of assistance to USACE with project execution or execution of projects in-house.

Within CFSC-CO, two branches – the Plans, Policy, Programming, and Administration Branch (CFSC-COP) and the Engineering and Construction Branch (CFSC-COE) – carry most of the NAFMC project delivery workload. The CFSC-COP is primarily responsible for the development of the NAFMC program. It provides centralized management of the NAFMC programming process, develops MWR facility policy and guidance, and provides administrative support to the Construction Directorate. Its primary functions include, for example,

- coordinating the development and maintenance of the NAFMC five-year program;
- reviewing, coordinating, and updating Army regulations relevant to MWR facility policy;
- representing the Army on selected policy development committees at Headquarters, Department of the Army (HQDA) and DoD levels;
- analyzing the successes and failures of the MWR construction program;
- developing the Construction Directorate budget; and
- coordinating and hosting the Construction Review Board (CRB) NAFMC program development briefings.

The CFSC-COE is primarily responsible for project design and construction. It provides centralized management, as well as technical support, for the design and construction of the NAFMC projects. Its functions include, for example,

- assisting business program proponents in developing reliable cost estimates used for determining potential business performance;
- program planning through the development of short- and long-range estimates of personnel and resources needed to execute projects;
- determining method of execution – design-build or design-bid-construct;

- providing project management and technical capabilities required for mission accomplishment;
- negotiating support agreements with and authorizing (by directive) USACE to plan, design, and construct NAFMC projects worldwide;
- providing HQDA staff oversight during the execution of NAFMC projects to ensure established procedures, policies, regulations, and congressional guidance are met;
- developing the requirements for outside contractor support;
- developing training initiatives on the unique requirements of the NAFMC program and construction project execution;
- directing contracting actions for the design, construction, design-build, and consultant services; and
- reviewing and revising, as necessary, all procedures and initiatives affecting the NAFMC program.

Other directorates within CFSC assist the CFSC-CO with contracting, business program development, resource planning and programming, requirements development, and financial management, among other services. For example, the Directorate of Business Programs (CFSC-BP) provides program development and oversight of bowling centers, clubs, guest houses, marinas, and golf facilities. Likewise, the Directorate of Family Support (CFSC-FS) is responsible for youth centers, and the Directorate of Community Recreation (CFSC-CR) is responsible for skill development centers, outdoor recreation centers, stables, and swimming pools. The Resource Management Directorate (CFSC-RM) tracks and maintains the status of all financial aspects of the NAFMC program, and the Contracting Directorate (CFSC-NC) is responsible for all contracting actions relating to NAFMC.

CURRENT AND PROJECTED FUNDING

Depending on its category, an MWR activity can receive either APF or NAF for construction, operations, maintenance, and repairs. APF are used primarily for the construction, operations, and maintenance of all category A and most category B activities. NAF, generated primarily by sales, fees, and charges from existing MWR business activities, are used for some category B and all category C facility construction. The CFSC's major construction program is funded solely from NAF and therefore, manages the program development and project execution of mostly category B and C activities.

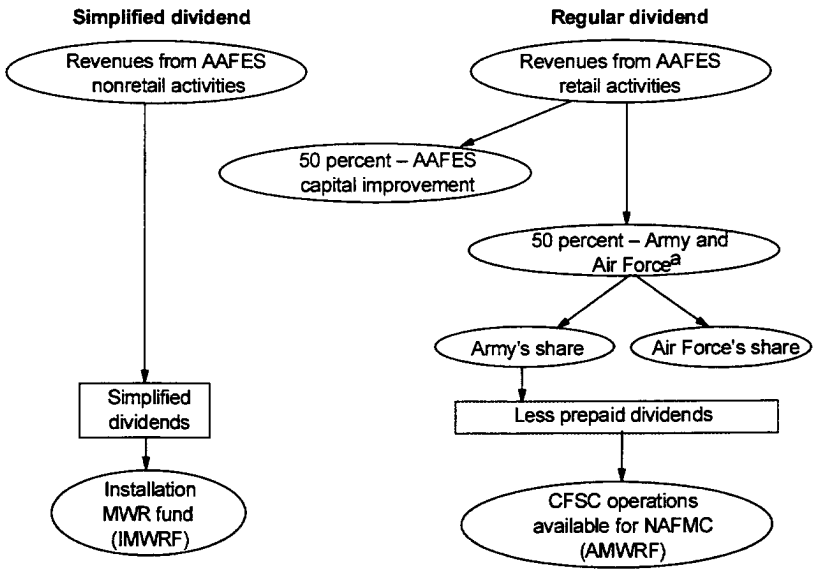
Resources for NAFMC projects can come from one, or a combination, of the following sources:

- *Army MWR fund (AMWRF).* The AMWRF is generated almost entirely by AAFES dividends (see Figure 2-2). The remainder comes from interest on the existing balance of funds. AMWRF funds are controlled by the Army on behalf of the Army community and account for most of the new NAFMC project funding in any given year. During the annual NAFMC program development cycle, Army installations and MACOMs develop, submit, and defend their requests for using AMWRF resources.

- *Installation MWR fund (IMWRF).* The IMWRF is generated mostly from local AAFES simplified dividends and the profits from local MWR activities such as golf courses, clubs, or slot machines. A small portion of the IMWRF may be generated from interest on the balance. The IMWRF is controlled by the installations and their MACOMs and can be used for the development, design, and construction of installation-funded NAFMC.

- *Army Recreation Machine (ARM) trust fund.* The ARM trust fund is generated from slot machine profits. Of the total slot machine profits, the host installation gets 10 percent (for their IMWRF), and the remaining 90 percent is split between the MACOM and CFSC for special-purpose projects.

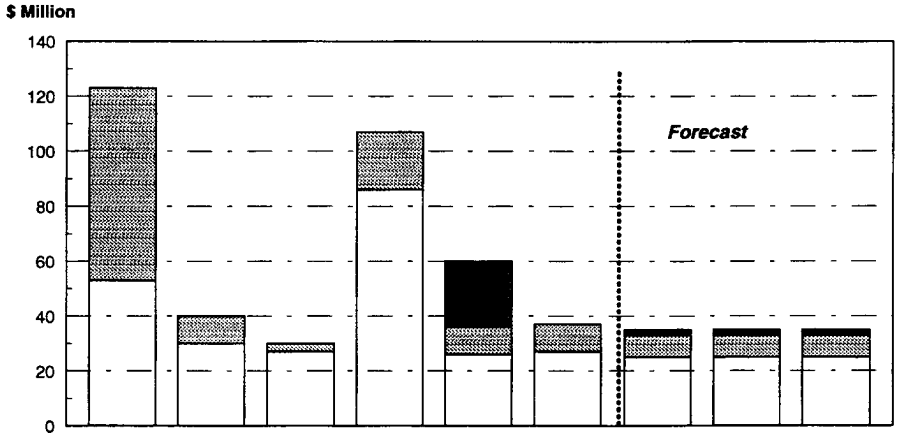
- *Third-party financing (i.e., a public-private venture).* Some MWR activities are funded by third-party financing in which local installations, the MACOMs, or CFSC work with interested contractors to finance privately the construction and operations of MWR facilities.



[a]Distribution based upon force end strength

Figure 2-2.
AAFES Dividends Calculations

The CFSC supports the execution of the total NAFMC program regardless of whether AMWRF, IMWRF, or other resources are used. Therefore, it is the total NAFMC program amount that drives the required levels of CFSC staffing support today and will continue to do so in the future. Figure 2-3 shows the total NAFMC funding levels for FY90 through FY94 and projects the FY95 through FY98 levels. The FY94 NAFMC program is funded at just $60 million, less than 60 percent of the preceding year. The figure demonstrates the high degree of fluctuation in the NAFMC funding over the last five years. In the future, the funding levels are likely to decline further from FY94 levels as the Army force structure continues to decline. That downward trend will result from the shrinking potential business base, which will likely lead to lower MWR sales in general, lower AAFES sales, and, as a result, reduced profits and dividends contributing to the AMWRF and local IMWRFs. The CFSC's resource management activity forecasts a moderately sized total NAFMC program of about $37 million for the next five years.



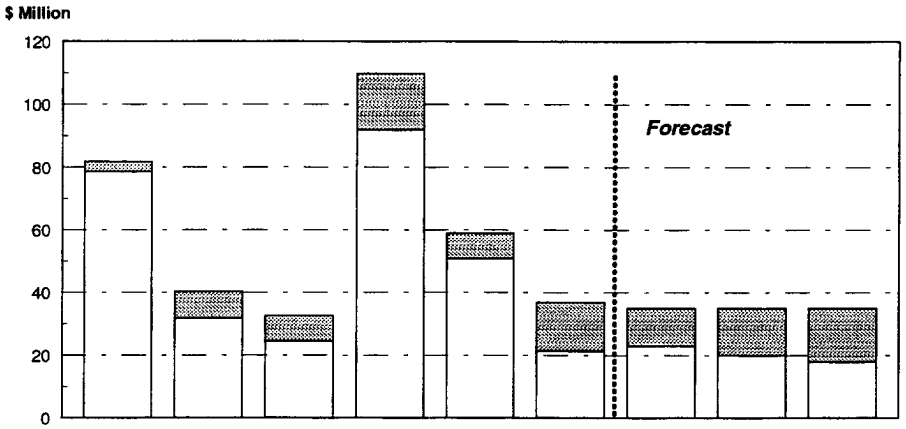
Fiscal year	1990	1991	1992	1993	1994	1995	1996	1997	1998
AMWRF	53	30	27	86	26	27	25	25	25
IMWRF	70	10	3	21	10	10	8	8	8
Other	0	0	0	0	24	0	2	2	2
Total	123	40	30	107	60	37	35	35	35

Figure 2-3.
Total NAFMC Resources

PROGRAM PROFILE

While historic, present, and projected NAFMC funding levels help to determine the future levels of program staffing support, we also need to understand the future requirements for the MWR program so we can determine how that program is likely to be executed. For instance, some renovation projects are beyond the capability of CFSC-CO's in-house staff and, therefore, must be executed by USACE. Similarly, CFSC does not have the infrastructure to support overseas construction projects and consequently, must again rely on USACE.

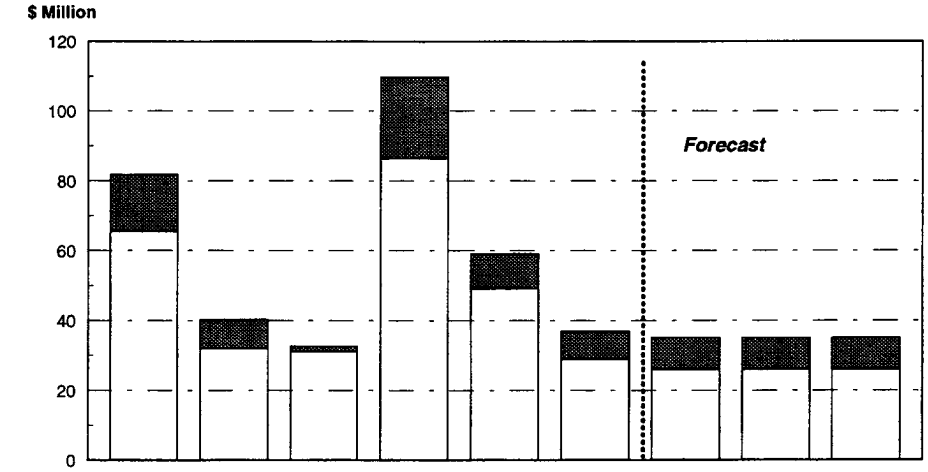
In analyzing future MWR program requirements, we examined the distributions of new construction versus renovation work and of domestic versus overseas projects. As shown in Figure 2-4, the mix between new construction and renovation projects has varied significantly. Renovation projects have accounted for as little as 4 percent of the total program and as much as 42 percent. In the future, however, the program is likely to be about equally divided between new construction and renovation projects. By FY98, for example, renovation projects will constitute 49 percent of the total. Renovation work, as a percentage of the total NAFMC program, will likely continue to increase because it may be easier for installations, faced with declining forces and funds, to justify expansions or upgrades rather than new construction projects.



Fiscal year	1990	1991	1992	1993	1994	1995	1996	1997	1998
New constr.	78.6	31.8	24.5	91.9	50.9	21.4	23.0	20.0	18.0
Renovation	3.2	8.5	8.1	17.9	8.2	15.5	12.0	15.0	17.0
Total	81.8	40.3	32.6	109.8	59.1	36.9	35.0	35.0	35.0

Figure 2-4.
NAFMC Program Profile — New Construction versus Renovation

As shown in Figure 2-5, the percentage of overseas projects has been fairly consistent in the past; except for the FY92 program in which only 5 percent of the projects were executed overseas, overseas projects have represented about 20 percent of the total NAFMC program. Starting in FY96, the size of the overseas program will increase slightly and will likely remain constant at just over 25 percent of the total program through FY98. The overseas portion of the NAFMC program is likely to remain fairly constant in the future because MACOMs in overseas locations will always execute at least a handful of projects from one year to the next. Base realignment and closure (BRAC) is one factor that could reduce the program, but most of the impacts from overseas base closures have already been felt from announcements in BRACs 88 through 93.



Fiscal year	1990	1991	1992	1993	1994	1995	1996	1997	1998
U.S.	65.6	32.0	31.1	86.4	49.1	28.9	26.0	26.0	26.0
Overseas	16.2	8.3	1.5	23.4	10.0	8.0	9.0	9.0	9.0
Total	81.8	40.3	32.6	109.8	59.1	36.9	35.0	35.0	35.0

Figure 2-5.
NAFMC Program Profile — U.S. versus Overseas Projects

CHAPTER 3

Current Project Delivery Process

The process for delivering NAFMC projects has evolved over the years in response to changing facility requirements, market conditions, and available funding. An effective process benefits CFSC by ensuring only technically and financially valid projects are considered, the cycle time to deliver a project is as short as possible, and staff resources to deliver the program are kept to a minimum. By approving only valid projects that broadly benefit the Army, CFSC can save valuable resources that can then be used for other future high-priority needs. In this chapter, we examine the NAFMC project delivery process as it exists today to determine if it is still responsive to CFSC's, the Army's, and the soldiers' needs. We begin the chapter with a discussion of the life cycle of a typical project. That description includes baseline activity durations and relationships, and current levels of CFSC staff involvement. We then discuss each major phase of the process in more detail. Finally, we address process deficiencies and other issues relevant to the cost-effective delivery of NAFMC projects.

PROJECT LIFE CYCLE

The project life cycle for a typical NAFMC project begins when the need for the project is identified and ends after the construction is finished and the contract is closed financially. Each major phase of a typical NAFMC project is bounded by significant milestones common to most construction projects, whether managed by the DoD, another government agency, or a private business. The major NAFMC phases are as follows:

- *Program development.* The program development phase begins when the need for a facility is established by the installation or MACOM, which is usually driven by the results of the installation's Triennial Needs Assessment (TNA). The process that installations use to determine a requirement is beyond the scope of this analysis. The end of the program development phase is signaled by approval of the NAFMC program by the CRB. A project validation assessment (PVA) of every project is required during program development before the CRB meets.

- *Project validation assessment.* PVAs are performed by an independent contractor to determine the financial viability of a project. The assessment includes a market analysis of customer perceptions and local competition, cash flow projections, and a cost-benefit analysis. The PVA begins after a project requirement is established by the users, validated by the CFSC, and sufficient PVA funding is certified. During the PVA phase, CFSC assigns the contractors, oversees its completion, has the construction cost estimated,

coordinates findings with the users, and reviews the draft and final reports. The PVA phase ends with the acceptance of the final report.

- *Review and approval.* The program review and approval phase begins after the NAFMC program is finalized by the CRB. During this phase, NAFMC projects go through eight, distinct review steps, including a final Army level review by the BOD, which establishes total obligational authority, before they are finally approved and released for execution by the Congressional House Armed Services Committee (HASC) MWR subpanel.

- *Project execution.* The project execution phase includes all tasks for selecting A-E and construction contractors, designing and constructing the project, and managing project finances. For all NAFMC projects, execution may start as soon as the CRB finalizes the NAFMC project list and the BOD approves program funding. The execution of NAFMC projects may be managed by CFSC staff or by an assigned USACE district, and it may be accomplished using one of the following execution approaches:

  - *Design-bid-construct approach* – the traditional MILCON approach in which two separate contract actions are required, one for an A-E firm and another for a construction contractor. The two actions are sequential; the A-E firm designs the facility and generates the documentation needed for the solicitation and award of the construction contract.

  - *Design-build approach* – construction project delivery approach in which a single contractor (or two contractors working in a partnership) is hired to perform and manage both the design and construction of the project. Because completed construction documentation is not required to solicit a second contractor, design-build contractors can begin construction as soon as the necessary site plans are complete.

- *Project closeout and postoccupancy assessment.* The closeout and postoccupancy phase of a project begins after the facility is accepted by CFSC and the users; it ends when final claims are resolved, all bills are paid, and all contract actions are resolved. During that period, CFSC conducts a postoccupancy assessment to analyze the financial and operational performance of the project against its initial projections.

During all phases of the project life cycle, resources and project financing must be managed continually. The tasks of certifying funds, tracking costs, funding in-house personnel and other resources, paying for contracted services, and otherwise managing the money are critical to keeping projects moving smoothly through the process. Because financial management activities transcend all the major phases discussed above, it is difficult to define specific start and finish points, but, where appropriate during the following discussion, we identify important financial milestones such as specific and relevant fund certifications, required financial analysis, release of project funding, and financial closeout of the projects.

While the overall NAFMC project delivery process is well understood by CFSC project managers, program managers, and CFSC management, the existing NAFMC delivery process is not well documented. Therefore, to generate the information needed to analyze the process, we produced activity models, CPMs, and activity-based costs for both design-build and design-bid-construct projects utilizing the vast experience of CFSC's employees. Working with CFSC's PAT, we developed IDEF context diagrams and a detailed activity model with 113 nodes that illustrates the major NAFMC process inputs, outputs, the existing controls or constraints on the project delivery process, and resources needed to deliver projects. Also, we developed a 144-task critical path network to model typical design-build projects and a 141-task network for the design-bid-construct approach to show relationships among the various project delivery activities and to demonstrate the expected time for reaching each of the important milestones demarcating the NAFMC project phases. While no detailed quantitative or statistical data existed for establishing the task durations, we were able to validate each of the major project phases by comparing the model's milestones with established events such as the CRB meeting, PVA start and finish dates, and the HASC subpanel meeting, which occur at the same times every year. CFSC professionals and managers verified that the activities, milestones, durations, and network logic were sound and reasonable.

Figures 3-1 and 3-2 illustrate a Gantt chart summary of the expected durations and relationships of the major phases of the typical NAFMC project using the design-bid-construct and design-build approaches. Detailed IDEF activity models are presented in Appendix B, and the activity networks are presented in Appendix C. Using either project delivery approach, CFSC is able to plan, program, approve, design, construct, and closeout a NAFMC project in about five years or less. Under the best scenario, and using the design-build approach, CFSC can get a needed facility into operation in under four years.

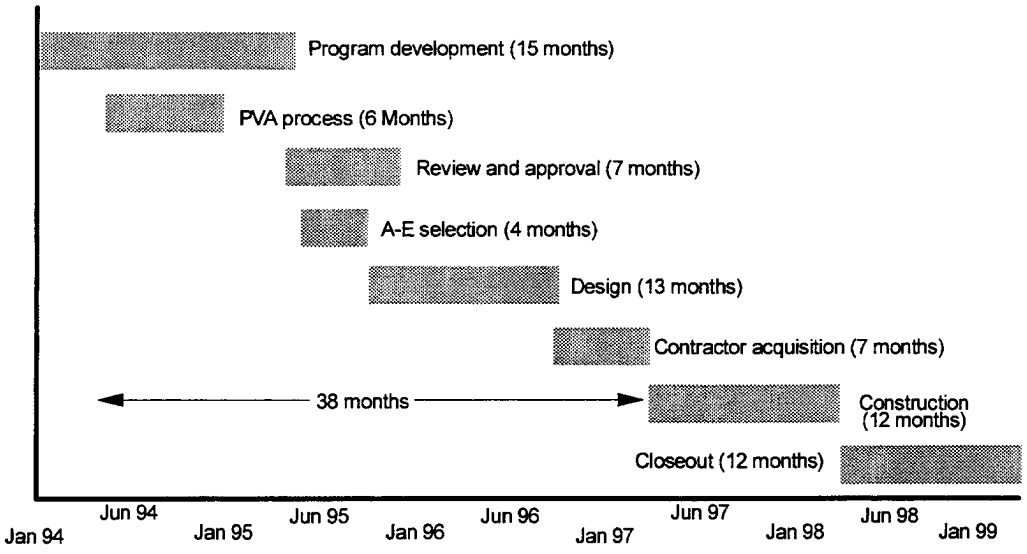


Figure 3-1.
NAFMC Project Delivery Using Design-Bid-Construct Approach

Because project construction and closeout can vary dramatically from project to project, the critical period for delivering a NAFMC project begins with identification of the need for a project and ends when construction is started: 38 months for design-bid-construct projects and 30 months for design-build projects. Two of the critical and immovable events during that time are the project funding approval by the BOD, which meets in February or March, and the release of the NAFMC program by the HASC MWR subpanel, which meets in October or November. It is therefore critical that program development and all review and approval activities are planned so that they are complete and ready for the BOD and congressional reviews. The design contractor acquisition and request for proposal (RFP) development are contingent on the BOD approvals, and the construction or design-build contractor acquisition is contingent on HASC MWR subpanel program release.

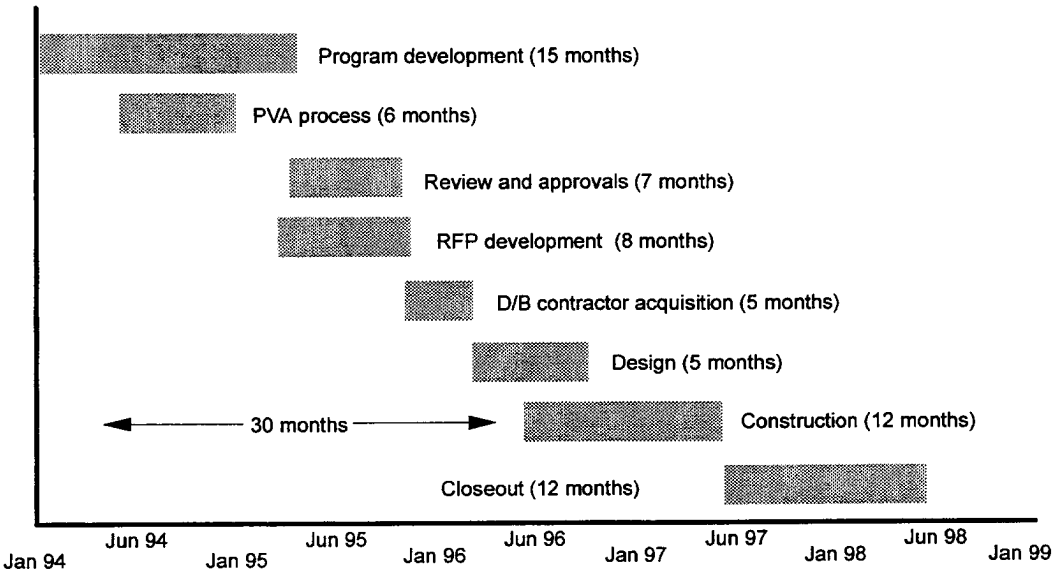


Figure 3-2.
NAFMC Project Delivery Using Design-Build Approach

Table 3-1, generated from the IDEF and ABC models, summarizes the total amount of CFSC staff effort associated with each major project phase in the current NAFMC project delivery process. In any one year, CFSC's required staff effort to manage and perform program development, project validation, program review and approval, project execution (including all contractor acquisitions, RFP development, and construction for both all projects), and project closeout can require an estimated 21.7 person-years of effort. While the actual level of effort will vary from year to year as the size and nature of the NAFMC program vary, our estimate can serve as a metric against which to compare the improved process. The differences in staff effort between the baseline and the proposed process represent the potential cost savings in process improvement. The detailed ABC results can be found in Appendix C.

Table 3-1.
CFSC Staff Effort for Project Phases

Project phase	CFSC effort	
	Person-years	Percent of total
Program development	1.3	6
Project validation assessment	3.3	15
Review and approval	3.9	18
Project execution	12.9	60
Design-bid-construct	4.2	19
Design-build	3.4	16
Project finances	5.3	25
Closeout and postoccupancy assessment	0.3	1
Total	21.7	100

PROGRAM DEVELOPMENT

Program development takes 15 months and includes all the tasks required to identify, prioritize, consolidate, and approve the total NAFMC program for a given fiscal year. During those 15 months, CFSC establishes the expected program amount; reviews, advises, and approves DD 1391 project submissions; assigns a program manager and a project manager to each viable task; assesses the technical and financial feasibility of the projects; and schedules and convenes the CRB meeting. During the program development phase, projects submitted by the installations or MACOMs may be accepted as is, returned to the users for a change in scope, postponed to following years, or ruled out altogether. CFSC invests about 1.3 person-years, or about 6 percent of the total NAFMC program delivery effort, into the program development process. The IDEF activity model, ABC outputs, and detailed CPM charts in the appendices provide more detail about the activities, including how long each takes and how much effort is associated with each activity.

The two primary inputs into the program development phase are the previous year's five-year NAFMC plan and the results of the most recent patron survey. The NAFMC five-year plan is developed each year by the installations and MACOMs and identifies their MWR facility needs for the current year as well as for the next four years. The patron survey is conducted every three years to identify consumer preferences for MWR activities. Generally conducted by a contractor, the triennial MWR needs survey looks at local market conditions, the conditions and uses of existing MWR facilities, and the cost of alternative means to satisfy a particular MWR need. The outcome is the TNA, a comprehensive evaluation of an installation's MWR needs. The installation or MACOM uses the TNA, as well as the results of any special-purpose patron surveys, as the basis

for developing its list of MWR projects that are included in its five-year NAFMC plan. The list of current-year projects becomes the basis for the installation's annual submission of projects to its MACOM and then to CFSC using a synopsis or front page of a DD 1391.

The CRB was established to review, approve, and prioritize all the Army's MWR projects for the annual NAFMC program submission to Congress. The objective of the CRB is to examine the consolidated and unconstrained MWR project needs and to eliminate weak, unnecessary, and unsupported projects, thus ensuring that the NAFMC projects selected for funding are of high quality and meet the needs of soldiers and their families. The CRB comprises representatives from the Assistant Chief of Staff (Installation Management) [ACS(IM)], HQDA, USACE, and all of the MACOMs; it is chaired by the Chief of Staff of CFSC. Only the MACOM representatives have voting privileges, and the chairman votes only in cases of a tie. Representatives from all CFSC directorates attend the CRB meeting to provide counsel and advice, but they are not permitted to vote.

During the CRB meeting, the installation or MACOM representatives present briefings on the proposed projects. After each project briefing, the CRB votes on that project and assigns it a rank that indicates its relative priority among the other projects competing for AMWRF resources. To facilitate and help ensure that only the most qualified projects are selected for approval, the CRB has recently begun using a prioritization matrix, but thus far, use of the prioritization matrix has been ineffective. The outcome from the CRB is a finalized and approved NAFMC program that consists of technically feasible and financially viable NAFMC projects.

Following the CRB meeting, CFSC prepares official minutes and distributes them to the MACOMs. The minutes include, where applicable, DD 1391 action items for the MACOMs. The MACOMs correct the DD 1391s and return them to CFSC via an automated information system. The CFSC reviews each MACOM's corrected DD 1391s to ensure that all problems identified by the CRB have been resolved, then submits the CRB-approved NAFMC program to the BOD executive committee and HQDA authorities, thus beginning a series of review and approval steps by USACE, HQDA, the DoD, and the congressional MWR subcommittee.

Project Validation Assessment

Mandated by Congress, a PVA is performed for every NAFMC project competing for AMWRF resources. PVAs have been required since the FY86 program and are an attempt to preclude the inclusion of unjustified or financially unreasonable projects in the NAFMC program. Congress is concerned that the soldiers' own money (the NAF resources) not be spent on unsupported or unnecessary projects and that the completed NAF facilities, which may use APF to maintain them, not overburden the installation's APF functions. Today, all projects competing for funding approval at the CRB must have completed PVAs; the PVAs are funded out of the installation's or MACOM's IMWRF. PVAs,

which are prepared by independent contractors, include a definition of the project scope, a project cost estimate, and return on investment (ROI) projections. The results of the PVAs are used as part of the justification for approving and prioritizing the individual project. CFSC establishes and sustains indefinite-delivery contracts with several PVA contractors so that, when needed, PVAs can be performed expediently.

The specific type of PVA conducted depends on the type of project proposed. The PVAs are categorized as follows:

- *Category 1 – limited PVA.* Designed for MWR projects estimated to cost $500,000 or more, this category includes (but is not limited to) projects that are more maintenance in nature, e.g., construction or upgrade of recycling facilities, maintenance facilities, or storage facilities, or installation of sprinkler systems on golf courses.

- *Category 2 – limited PVA.* This category is designed for MWR category C projects that are estimated to cost $500,000 or more.

- *Category 3 – complete PVA and market analysis.* This category is similar to category 2, but it includes a customer survey and focus group sessions.

- *Category 4 – nonstandard PVA.* The level of study and type of personnel required for this type of PVA vary widely. Consequently, a fee proposal is required for these PVAs. The final report may consist of a full or an abbreviated report depending on what is specified in the delivery order.

- *Category 5 – nonstandard PVA.* This category covers consulting services by the contractor for evaluating MWR activities and recommending ways to improve management, operations, and profitability of an activity. A fee proposal is required for this type of PVA because level of effort and type of personnel required vary widely.

The PVA process starts in May or June after CFSC validates all the project requirements from the users and certifies that adequate funds are available. On average, the process takes 150 to 180 calendar days (5 to 6 months). Within the CFSC organization, managing the PVA requirement demands 5,568 person-hours (3.2 person-years) of staff effort. The actual fixed price of a PVA study starts at $13,000 and varies according to the above-defined categories; most PVAs cost between $20,000 and $60,000. On average, an installation paid $34,000 for a PVA in FY94. Detailed ABC outputs and activity models can be found in the appendices.

A PVA is initiated when the MACOM requests that CFSC undertake a PVA for a specific project and submits funding documentation to CFSC, which helps to ensure the installation's and MACOM's commitment to the project. Within CFSC, the CFSC-COP verifies the project request on the form DD 1391. Poorly documented projects are returned to the installation/MACOM for correction. Valid project requests are sent to the appropriate CFSC program

directorate – e.g., CFSC-BP, CFSC-CR, or CFSC-FS – which assigns a program manager to oversee the project. The program manager notifies CFSC-RM of a request for PVA, which in turn certifies the availability of funds submitted by the users. Once CFSC-RM has certified the funds, the program manager submits to CFSC-NC a purchase request for a PVA contractor. The CFSC-NC then selects a PVA contractor, and the program manager monitors PVA completion and reviews and approves the contractor's draft and final reports. The PVA development phase ends with the acceptance of the final report. That report serves as the justification for prioritizing and approving specific projects at the CRB.

The process of acquiring a PVA contractor is relatively simple. The CFSC-NC maintains a list of prequalified PVA contractors on indefinite-delivery contracts and thus eliminates a time-consuming acquisition every time a PVA is required. Individual PVAs can then be funded by delivery order against the contract. The CFSC notifies the selected contractor of the need to begin a PVA at a particular location. From the time he is officially notified, the PVA contractor has 30 days, according to the contract, to begin developing the project scope and to prepare for a site visit where most of the market, consumer, and financial data will be collected. The CFSC also notifies the cognizant USACE district, which is responsible for estimating the project costs. The actual site visit takes about 4 to 5 days and is attended by CFSC's program manager, a project manager from CFSC-CO, three or four PVA contractor representatives, and one or two USACE personnel. The PVA contractor then has 15 days to synthesize the data and finalize the project scope statement.

Once the project scope statement is completed, USACE has 10 days to estimate project costs. Because project scope and project costs are interdependent, it is not unusual for the PVA contractor and the USACE representatives to have difficulty reaching an agreement on the final project scope. The accuracy and quality of those facility cost estimates is discussed in the following section.

After receiving the cost estimate from USACE, the PVA contractor has another 12 days to calculate the ROI for the project using an ROI template developed by CFSC. The installation, MACOM, and CFSC then have 20 days to review the draft PVA report, which may go through several iterations before it is accepted. When the PVA contractor's results differ from the expectations of the installation, the installation has the option of refuting those findings. However, the program managers generally support the recommendations of the PVA contractor because, as advocates of the project, they want an impartial analysis of the project's economic viability. After all of the final comments are received, the PVA contractor has 12 days to prepare a final report; PVA contractors generally have little difficulty in delivering final reports on time.

Construction Cost Estimating

Because estimating costs is part science and part clairvoyance, some variances in facility cost estimates are inevitable, particularly when the estimate is completed one or more years before the project is constructed. For CFSC, a

margin of error around 10 percent is acceptable; however, when construction costs for any particular project exceed 125 percent of the cost estimate, reprogramming actions through Congress become necessary, which can severely undermine the timely completion of that project.

Historically, installations estimated construction costs using either their local Corps district or their Directorate of Public Works (formerly the Directorate of Engineering and Housing). Starting with the FY89 program, the PVA contractors began preparing the construction cost estimates in an effort to streamline the program development process. However, because the PVA contractors were unfamiliar with military construction criteria used by the USACE, they had difficulty estimating facility construction costs that met CFSC's and USACE's perception of accuracy. As a result, the PVA contractor's estimates were frequently challenged, which led to more rework than was anticipated and added time to the PVA phase. Consequently, the USACE now performs all cost estimates for the PVA contractors during the PVA development phase for a fixed fee of $10,000 and a stipulated maximum time frame of 10 working days.

By industry standards, the quality of a facility cost estimate is a function of preparation time, cost, and accuracy in relation to the final construction amount (adjusted for changes to the original scope of the project and unpredictable fluctuations in labor and material costs). Typically, there is a tradeoff between the accuracy of the estimate and the amount of time, effort, and expenses associated with preparing it. Sometimes a gross estimate is all that is needed; for planning purposes, for instance, an estimate that is accurate within 20 percent may be sufficient. In other cases, final budget submittals, for instance, a higher degree of accuracy — 10 percent margin of error — may be imperative.

The construction industry relies on four broad types of cost-estimating techniques that provide varying levels of accuracy for level of effort invested: gross estimates, parametric estimates, system/assembly estimates, and unit takeoff estimates. While no cost-estimating technique can be accurate within a few percentage points on every project, the accuracy can be improved with more effort by the estimator. However, achieving higher levels of accuracy has higher costs. and higher costs. Table 3-2 illustrates the tradeoff between expected accuracy and costs within the industry.

A gross estimate is a general one; it takes one or two hours to prepare and should be accurate within 20 percent of the final construction costs. Parametric estimates are further refined and based on established costs per square foot. By calculating total square footage of various types of spaces and adjusting for local conditions, a professional estimator can develop an estimate that is accurate within 15 percent, while investing only one or two person-days of effort. The system/assembly estimate is far more accurate at plus or minus 5 to 10 percent. However, achieving that accuracy requires 4 to 5 days of effort plus another 4 to 5 days if a site visit is necessary. The unit takeoff estimate, the most time intensive of the four, can require as much as 15 to 20 person-days of estimating effort

and the use of a fairly advanced design drawing package, but should be accurate within a 5 to 7 percent margin of error. A unit takeoff estimate usually is not performed until detailed cost estimates are necessary.

Table 3-2.
Expected Accuracy and Effort of Industry Cost-Estimating Techniques

Estimate type	Margin of error (percent, plus or minus)	Level of effort[a]
Gross	20	1 – 4 person-hours
Parametric	15	1 – 2 person-days
System/assembly	5 – 10[b]	4 – 5 person-days
Unit takeoff	5 – 7	15 – 20 person-days

[a] Add five person-days if site visit is necessary.

[b] Should be close to 5 percent, as long as scope is clear and site analysis is performed well.

When NAFMC projects need estimates, relatively little detailed information is available to USACE estimators. The project scope, historical costs on similar projects, and site visit data may be all the estimators have at their disposal. Therefore, USACE estimators use the system/assembly technique to prepare the NAFMC project cost estimates which is the most accurate form of estimating possible with the information at their disposal. Accuracy within 5 to 10 percent should be expected.

To determine the accuracy of previously performed cost estimates, we calculated the percentage difference between the program amount approved by Congress and the certified construction award amount (less any funds for supervision and review; supervision and administration; and fixtures, furnishings, and equipment). The results in Table 3-3 show that past estimates have, on average, been well within what is expected by industry practices. Overall, the NAFMC cost estimation system appears to be functioning reasonably well by any standard – private or government. For six of the seven years for which we have data, the cost differential between the NAFMC program amount and the contract award amount was 10 percent or less. This margin of error meets the industry standard for the level of effort expended. The cost differential for the remaining year, FY91, is 12 percent; this higher margin of error can be attributed to a combination of factors, including the construction moratorium in FY90 and changing market conditions that were not reflected in project estimates for that program year. In addition, only 5 percent of the NAFMC projects had cost differentials greater than 25 percent; that is, only 10 projects had to be submitted to Congress for reprogramming, and only 8 of those were for funding increases. Appendix H contains a more detailed analysis of past cost estimates.

Table 3-3.
Accuracy of Cost Estimates

Fiscal year	Number of projects	Mean cost differential	Standard deviation	Number of estimates over 125 percent of program amount
1987	25	0.5	16.6	0
1988	50	8.1	17.5	4
1989	26	10.0	14.2	0
1990	17	2.9	11.3	0
1991	20	12.0	15.1	2
1992	10	10.5	21.2	1
1993	15	3.9	21.6	1
Total	163	6.9	16.8	8

Note: Mean cost differential represents the percentage difference between the program amount approved by Congress and the certified construction award amount.

REVIEW AND APPROVAL

The NAFMC program review and approval phase takes about seven months; it begins after the CRB approves the program and ends when the HASC MWR subpanel releases the program for execution. In total, the entire review and approval process requires just over 8,000 staff-hours (or the equivalent of about four staff-years) of CFSC effort in a given year, which represents about 18 percent of total staff effort associated with the NAFMC program. Appendix C contains specific person-hour costs for each review step listed below.

The following organizations are involved in the review and approval of the NAFMC program as finalized by the CRB:

- BOD, including the executive committee
- USACE technical review committee
- Construction Requirements Review Committee (CRRC)
- ASA(IL&E)
- Assistant Secretary of the Army (Manpower and Reserve Affairs) [ASA(MR&A)]

- Deputy Assistant Secretary of Defense (Personnel Support, Family, and Education) [ASD(PSF&E)]

- HASC MWR subpanel.

The Army's BOD comprises the commanding generals of the MACOMs. The executive committee reviews the program and recommends action to the BOD. Based on the executive committee's recommendations, the BOD reviews and approves the program funding, establishing the total obligational authority for the MWR program.

While the BOD reviews financial aspects of the NAFMC program, USACE performs a technical review of all valid projects to assess the engineering adequacy of each project and ensures that the cost estimates are reasonable (a practice started when estimates were performed by the PVA contractors). NAFMC projects are reviewed again in the CRRC meeting as part of USACE's review of the entire Army construction program. (USACE has primary management responsibility, established by Army regulation, for all Army construction projects.) The CRRC considers the potential impact of the NAFMC program on the Army's overall construction program as well as such things as base closures, shrinking APF support at the installation level, and troop movements.

After the financial, technical, and upper echelon reviews and approvals are completed, CFSC and USACE prepare the Greenbook. The Greenbook, which summarizes DD 1391 data, includes all Army NAFMC projects – AAFES and commissary construction programs, as well as MWR projects – costing more than $500,000. The Greenbook is subjected to several final reviews by the ASA(MR&A) and the ASA(IL&E) and then is submitted to the ASD(PSF&E) where MWR programs for all the services are combined in preparation for final review and approval by the HASC MWR subpanel. At any given step in the review and approval process, NAFMC projects may be selected for more information, further clarification, or elimination from the program.

During the HASC MWR subpanel meetings, CFSC briefs members of the subpanel on the NAFMC program. Program managers from the appropriate directorates within CFSC brief selected projects from each MWR activity category and answer questions. When MWR subpanel members request additional data, CFSC is responsible for complying with those requests. The CFSC complies with these data requests by requesting additional data from the MACOMs.

After the HASC has reviewed the annual NAFMC report, it notifies OSD of its decision regarding program approval, or "release." Once the HASC has notified CFSC that it has released a project, CFSC, in turn, notifies the MACOMs. The Construction Directorate, as CFSC's construction agent, notifies project managers, either in-house or at the cognizant Corps district, of projects that have been released. Once projects are released by the HASC, the project manager can begin acquisition of construction contractors for design-bid-construct projects or can award contracts for design-build projects. Projects that are not released typically are suspended until requests for additional data have been satisfied, which

may delay execution to the following year. In other cases, projects may be canceled.

PROJECT EXECUTION

Because of the size of the NAFMC program (over $100 million of projects currently in execution) and the mix of projects (new construction versus renovation and domestic versus overseas), CFSC must execute projects with both in-house and USACE staff and both design-build and design-bid-construct delivery approaches. Table 3-4 summarizes the various methods of project delivery.

Table 3-4.
Current Methods of Project Delivery

Method	In-house (percent)	USACE (percent)	Total (percent)
Design-build	30	20	50
Design-bid-construct	<1	50	50
Total	30	70	100

The traditional design-bid-construct approach is well entrenched in USACE and other Federal agencies but has some drawbacks. Because two sequential contract actions are required, it often takes 6 to 10 months longer to reach the construction phase than does a more innovative approach. Also, design-bid-construct places most of the quality assurance responsibility, and therefore much of the risk for cost growth during the project, on the building owners (e.g., CFSC). Design-bid-construct projects are notorious for creating adversarial relationships among the design contractor, the construction contractor, and the building owner. Because nearly all projects using the design-bid-construct approach experience construction modifications and ensuing claims, owners can expect additional administrative, contractual, and legal burdens.

The design-build approach is more innovative and is growing in popularity in both the private and public sectors. Design-build is a project delivery process that uses a single contractor (or two contractors working in a partnership) to perform both the design and construction of the project. Design-build offers owners a number of advantages. For example, CFSC has practically no design error liability, resulting in very low project cost growth. Also, construction projects often can be started 6 to 10 months sooner because only a single solicitation is necessary and only a limited amount of design is required before construction can begin. When site and foundation plans are accepted, the owner can issue the contractor a limited notice to proceed with site work while the rest of the design work continues simultaneously. Finally, design-build saves the CFSC project administrative costs because the contractor assumes the quality control

Design-build is the preferred method for executing new construction MWR projects costing more than $1.5 million, and there is a growing trend to manage those projects using CFSC's in-house staff. Because CFSC recognizes that design-build completes facilities faster and with less risk to the government, CFSC also encourages the USACE to employ the design-build approach whenever feasible, and even provides the needed training to the USACE staff to encourage its transition to what is a new technique for some USACE managers and engineers. Design-bid-construct is the preferred method for all renovation projects and for new construction projects costing less than $1.5 million. (Many contractors are unwilling to submit design-build proposals on projects under $1.5 million because it is difficult to recapture the costs of preparing a design-build proposal.) Almost all projects that must use the design-bid-construct approach are executed through the USACE because CFSC does not have the in-house contracting or administrative infrastructure to execute design-bid-construct projects effectively.

Design-Bid-Construct Process

Architect-Engineer Selection and Project Design

The A-E acquisition process begins when CFSC has a USACE district assigned to an approved project and issues a code 1 directive. The A-E acquisition phase ends when the A-E is selected. A-E acquisition cannot begin until the CRB finalizes the NAFMC project listing and the BOD approves program funding and establishes total obligational authority.

Unlike the MILCON process, CFSC is permitted to select A-E contractors for NAFMC and begin design work before projects are approved by Congress, which is one of the reasons NAFMC projects can be delivered so much faster. The A-E selection process is handled by the acting USACE district and takes about four months from the time CFSC issues a code 1 directive to the time the A-E firm is selected. Experience with other agencies suggests that four months is a reasonable average time frame for A-E selections even though, under certain circumstances, it can be performed more quickly.

The design phase begins with a predesign conference with the selected A-E firm and is complete when the design and bid package is finished and approved by CFSC. In design-bid-construct, the design and bid package must be 100 percent complete before beginning the process for acquiring a construction contractor. The duration of the design phase is of course dependent on the type of facility and its location, but because most NAFMC projects are similar, experience suggests that the design phase takes 12 to 13 months.

Construction Contractor Acquisition

Construction contractor acquisition follows the design phase and cannot begin until Congress releases NAFMC projects. This phase begins when the

assigned USACE district issues a code 9 directive and ends when a construction contract is awarded, typically taking about seven months. The USACE district prepares RFP package; advertises the solicitation; evaluates the offeror's proposals; and selects and awards the construction contract to the offeror on the basis of technical approach, cost, and previous performance. The responsible USACE district also handles the negotiations.

Construction

Construction begins with a preconstruction conference with CFSC, the contractor, and USACE representatives. Following the conference, the schedule is finalized, and the contractor can begin to mobilize to the job site. The construction phase is over when the facility is complete, final modifications and claims have been resolved, punchlist items have been identified and fixed, and the users have occupied and accepted the facility. (Detailed analysis of the construction and closeout phases of the NAFMC life cycle was beyond the scope of this study.)

Design-Build Process

RFP Development

For design-build projects, an RFP is required; its purpose is to ensure that the users and CFSC get the desired facilities within the desired costs. The solicitation package establishes the scope of the project and all required design criteria. Like A-E acquisition for design-bid-construct projects, RFP development cannot begin until the NAFMC project list is approved by the CRB and total obligational authority is established by the BOD. The process begins with the selection of an A-E firm (CFSC uses one of several A-E firms on indefinite-delivery contracts to develop the RFP acquisition package) and ends when that A-E firm has finalized and reproduced an RFP package for the design-build project. RFP development generally takes eight months.

Contractor Acquisition

Acquisition of a contractor to design and build the project can begin after the RFP is developed and ends when the contractor is issued a notice to proceed. For design-build projects, CFSC-NC performs the solicitation. It takes about five months to advertise the contract, respond to proposals, evaluate proposals, request and receive best and final offers, select the most qualified contractor, award the contract, and issue a notice to proceed.

For design-build projects, design begins after the contractor is issued a notice to proceed and ends when the design is complete and the contractor is issued a notice to proceed with final construction. However, construction of the facility can begin before all the design work is complete. For instance, site clearing and construction can begin as soon as the site plans are finalized and approved by CFSC. As a result, the construction process tends to run concurrently with the design efforts. The design-build contractor is responsible for coordinating the design and construction activities, while CFSC simply monitors the results. The construction phase is over when the facility is complete, final modifications and claims have been resolved, punchlist items have been identified and fixed, and the users have occupied and accepted the facility.

PROJECT CLOSEOUT AND POSTOCCUPANCY ASSESSMENT

The financial, program, and cost performance of MWR facilities is the responsibility of CFSC-RM. That responsibility includes evaluation of the operations of MWR facilities after beneficial occupancy has taken place. The final product from that evaluation is a postoccupancy report that compares actual MWR facility operations to the PVAs and installation projections; it also compares actual project construction costs to the original cost estimates. Presented formally to the CRB, the postoccupancy report provides Army decision-makers with feedback that they can use to refine their assessment of future NAFMC projects. Performance of the postoccupancy phase requires the effort of about one-third of a person-year.

PROJECT DELIVERY SYSTEM DEFICIENCIES

Identifying deficiencies to the current NAFMC project delivery process is the first step to identifying potential improvement opportunities. The deficiencies were identified using a combination of techniques: PAT meetings, interviews with individual process participants, and business process modeling tools. We consider an activity to be deficient if, for example, it hinders the delivery of high-quality projects on time and within budget, is inefficient, or uses excessive staff resources. Specifically, in our assessment of the NAFMC project delivery process, we looked at any activity that

- does not add value to the overall process,
- adds comparatively little value to the overall process given the resources required to perform the activity,
- is redundant,
- uses excessive resources,

- involves excessive amounts of rework,
- produces relatively low-quality results (i.e., errors or inaccuracies),
- takes too long to complete, or
- causes delays in completing the overall process due to timing, sequencing, or handoff requirements.

As a starting point, we used the results of the value analysis (see Appendix A), focusing first on activities in the process that require significant amounts of staff time. Those activities that consume the greatest amount of staff time are the best candidates for savings. Table 3-5 lists the top 20 non-value-adding activities in the current process, ranked by the number of CFSC staff-hours required to accomplish the activity. Three of the top 5 activities are associated with management of project finances; conduct of the CRB and editing of the DD 1391 rounded out the top 5 activities requiring significant staff resources. The top 10 activities alone require about 15,400 staff-hours and account for about 35 percent of the total effort associated with the delivery of NAFMC projects in a representative year. While we concentrated on activities that are necessary to the process but do not add value to the end product, we also looked at activities that add value to the project delivery system to determine, for example, if they are too complex. The results of our analysis are shown in Table 3-6, which lists activities that have major deficiencies, identifies the organizational unit affected, and indicates the degree of impact. The following subsections discuss the deficiencies in more detail.

Funds Certification

The ABC results show that funds certification takes approximately 10 percent of the time that CFSC staff devote to all NAFMC activities. For all parties involved, funds certification is cumbersome for a number of reasons: it is a completely manual activity, too many budget line items are being certified by CFSC to USACE, the number of handoffs is excessive, and fund certification tasks are processed in a set sequence that may be unnecessary. Furthermore, numerous telephone calls, memos, and letters are exchanged for funds certification on each project. Redundancies occur because both USACE and CFSC-RM track project invoices. Finally, no economies of effort exist because certification takes place separately for both the design and the construction phases of projects.

Table 3-5.
Top 20 Non-Value-Adding NAFMC Activities

Rank	Node	Node description	Percent of total	Total hours
1	A441	Certify funds	9.9	4,298.3
2	A442	Account for project funds	6.6	2,864.7
3	A324	Conduct CRB meeting	4.6	2,025.8
4	A361	Edit final DD 1391s	2.6	1,151.3
5	A444	Close out project finances	2.6	1,149.6
6	A15	Update CAPCES data base	2.4	1,026.3
7	A443	Prepare AMWRF cash flow	2.3	1,023.7
8	A4233	Administer design-build contract	1.6	683.7
9	A323	Prepare CRB read ahead	1.4	610.8
10	A31	Perform MACOM-level review and approval	1.2	528.8
11	A322	Develop project briefings	1.2	528.7
12	A355	Obtain HASC approval	1	457.4
13	A4111	Develop statement of work	1	451.8
14	A34	Perform technical review	0.9	413.1
15	A211	Develop statement of work and create evaluation plan	0.9	399.5
16	A353	Obtain OASA approval	0.8	361.9
17	A13	Develop DD 1391 front page	0.8	360.4
18	A321	Generate CRB letter of instruction	0.8	351.5
19	A4224	Award design-build contract	0.8	351.1
20	A215	Award indefinite-delivery contracts	0.7	297.3
		Total	44.1	19,146.7

Note: CAPCES = Construction Appropriation Programming, Control, and Execution System; OASA = Office of the Assistant Secretary of the Army.

Conduct of CRB Meeting

Preparation for and conduct of the CRB meeting require considerable staff effort at all levels of the Army. Project data and specifications must be reworked several times to prepare for the meeting. Most of this rework is on the DD 1391 and supporting documents. This problem is significant because of the number of projects that are submitted and reviewed compared to the amount that are actually funded. For example, 29 projects were submitted for the FY95 program, but because of funding constraints, only 7 projects were approved for funding. Too many projects were submitted, despite the fact that the MACOMs and installations were made aware of the restricted level of funding many months in advance of the meeting.

Table 3-6.
Deficiencies and Impact of the Current NAFMC Process

Activity	Deficiency	Organizational affected				Degree of impact
		USACE	Install.	MA-COM	CFSC	
Certify funds	Requires excessive resources	X			X	Large
	Takes too long to complete	X	X			Small
	Sequencing and handoffs cause delays	X	X		X	Large
Conduct CRB	Requires excessive resources		X	X	X	Large
	Requires excessive rework	X	X	X	X	Large
	Takes too long to complete		X	X	X	Large
	Timing causes delays		X	X	X	Medium
Prepare DD 1391s	Quality is low	X	X	X	X	Large
	Requires excessive rework	X	X	X	X	Large
Perform PVAs	Requires excessive resources (staff and total costs)		X		X	Large
	Parts redundant with TNA and five-year plan		X		X	Large
Prepare Green-book	No value added		X		X	Large
	Requires excessive resources	X	X		X	Large
	Requires excessive rework	X	X		X	Large
	Quality is low	X	X		X	Large
Plan projects	Quality is low	X	X	X	X	Large
	Requires excessive resources to develop five-year plan		X		X	Large
Manage project execution	Corps responsiveness is low	X	X	X	X	Large
	Corps takes too long to implement changes	X	X	X	X	Large
	Sequencing and hand-offs cause delays	X	X		X	Large
Review and approve	MACOM review adds no value			X	X	Large
	Requires excessive resources	X	X	X	X	Large
	CRRC/technical review adds no value	X			X	Small
	Sequencing and handoffs cause delays		X		X	Small
	Technical review is redundant	X			X	Small
Close out financial matters	Sequencing and handoffs cause delays		X		X	Medium
	Takes too long		X		X	Medium

The purpose of the meeting is unclear to some participants in the process. Initially, the CRB meeting was a forum for validating NAFMC projects (i.e., when almost all projects submitted could be funded), but has evolved into a forum for discussing the merits of individual projects and for prioritizing projects. However, the CRB meeting lacks an objective way to establish priorities. Although the results of the PVA are presented in a standardized format, most documentation needed for NAFMC projects does not have an organized structure that directly lends itself to prioritization. Much of the premeeting effort that goes into preparing documentation is less focused than it could be if a prioritization matrix and methodology existed. This lack of a clear project prioritization methodology causes, or exacerbates, many of the other problems in the NAFMC process. Without a clear methodology, the staff time and resources used by installations, MACOMs, and CFSC in preparing for CRB meetings tend to be unfocused.

The timing of the meeting in the program year also does not necessarily help to produce optimal project execution cycle time.

Preparation of DD 1391s

The DD 1391 has too many sections and is too long. Only the front page is the only one submitted to Congress. There is some feeling that the form, in its present structure, adds little value to the NAFMC projects delivery process.

Forms for a single project are reworked several times, often due to command management changes in scope. Furthermore, it is not always clear which version is the most current, so reviewers sometimes have inaccurate information because they have an outdated form. Changes in economic conditions also can cause the data to be outdated, requiring rework prior to the CRB or submission to Congress. While CFSC has recently put in place a method to deal with the determination of need for updates due to economic changes, rework due to command management changes in scope is still a major problem.

The responsibilities for project cost estimation are not well understood at all levels. Confusion about who is responsible for which pieces of the estimate at what point in time has become a major issue, especially at some MACOMs and installations. After many hours of discussion, the PAT concluded that these responsibilities are, in fact, clear according to Army policy and regulation. However, the team agreed that the misunderstandings by MACOMs and installations are real and need to be effectively addressed.

Project Validation Assessment

Overall, the PVA serves a valuable purpose relative to the money expended on individual projects. Even if Congress were to eliminate the requirement for such an independent assessment, CFSC stated that it would continue the PVA

function but would perform most of the PVA activities with in-house instead of contracted resources.

One deficiency of the PVA process is that the installations perform far too many PVAs given the available funding for projects. The individual cost of a PVA is not really a problem. For example, the average cost of a PVA in FY94 was $34,000; the price can range from $20,000 to $60,000, a relatively small amount compared to a project's total cost. However, the total cost for all PVAs conducted in a program year is unnecessarily high because of the number of PVAs being performed relative to the number that can be funded in the current financial environment. Because of the numerous reviews and coordination cycles that the PVA study must go through, each PVA requires a sizable amount of staff effort to monitor the progress to ensure the PVA is on schedule. The problem is exacerbated when many projects are being assessed. Considerable staff time, at all levels, could be reduced if project prioritization occurred early in the program development phase to accommodate the funding constraint issue.

Some parts of the PVA are redundant with the Triennial Needs Assessment. For example, data pertaining to the market demand for the facility are collected for both the PVA and the TNA.

Greenbook Preparation

The CFSC spends considerable resources on coordinating, revising, and correcting the Greenbook, all of which is time-consuming. In addition, the Greenbook has a cumbersome format. In particular, the lack of an executive summary makes the document difficult to understand and review. (DoD is currently considering this issue.) Finally, it is not clear why USACE, rather than CFSC, prepares the NAFMC Greenbook.

Project Identification and Planning

Unlike past policies that required an installation to put up 10 percent of a project's cost as a "down payment," the current NAFMC project delivery process has no built-in incentives that encourage installations to propose only high-quality projects. Because of this lack of incentive, installations conduct PVAs and submit to the CRB many projects with little chance of being funded.

Many projects are put together hurriedly and submitted at the last minute. As a result, project development is immature. This problem is related to the fact that the five-year NAFMC plan is out of sync with the TNA. The amount of work going into the five-year plan, including project cost estimates, is unnecessary (for the fourth and fifth years, at least). Consequently, the five-year plan is not an effective planning tool. Hence, the NAFMC process, despite the five-year plan, is in need of an effective and coordinated planning mechanism.

Project Execution by USACE

In general, USACE districts are often perceived to be unresponsive to CFSC needs; that is, the districts tend not give NAFMC projects the priority and attention that is acceptable to CFSC and the installations. This occurs primarily because the number of NAFMC projects in any one district is relatively small. As a result, the district may give higher priority to higher visibility construction projects.

The project execution process at the Corps district level can be bureaucratic. Consequently, it takes the field too long to implement changes in practices and policies mandated by CFSC. For example, a memorandum of agreement that provides guidance on the use of NAFMC contracting forms versus FAR forms was signed in October 1988, but it took over four years for the districts to implement the change.

Turnover at USACE can also be a problem at some districts, resulting in the need for constant retraining by CFSC's staff on NAFMC project execution methodology. The lack of continuity in USACE personnel, along with incidence of poor project management, is related to the problem of too few NAFMC projects occurring in any one district at any one time.

The USACE engineers are trained in, and are used to dealing with, FAR provisions and often apply them inappropriately to NAFMC projects. A good example is the A-E selection process.

Review and Approval

The MACOMs spend a lot of time and effort in reviewing NAFMC projects, but that review is without authority or impact. Furthermore, much of the MACOM time is wasted because too many projects (and PVAs) are submitted by the installations relative to the amount of funding available. For example, the CRRC review is just a precursor of the critical ASA(IL&E) review and causes delays in the submission process. The PAT believes that the CRRC review adds no value to the NAFMC process. In addition, the USACE technical review is unnecessary except in a few very specific instances. It is also redundant because the USACE district is already doing the cost estimate. The technical review is done primarily because of Army regulations but adds little value to the delivery process.

Financial Closeout

The forms used to notify CFSC when beneficial occupancy has taken place are not received expeditiously. The form is often used by CFSC as a signal to initiate insurance coverage, so its late receipt puts CFSC at risk of taking ownership of a building that is not insured. Actual closeout requires getting USACE's

invoices paid quickly. CFSC is not convinced that the USACE districts are timely, in this regard, on NAFMC projects.

CHAPTER 4

Conclusions, Recommendations, and Implementation Strategies

Through the MWR program, the Army leadership continues to demonstrate its commitment to a high quality of life on its bases as a way to lift morale, sustain readiness, and attract and retain its most valuable resources – the soldiers. Because the MWR program is, for the most part, sustained by revenues generated from the sale of market-driven goods and services, Congress allows, and the Army encourages, CFSC to manage the MWR program and use businesslike methods. As a result, CFSC provides new facilities quickly and cost-effectively. Among other things, CFSC has consistently completed MWR projects on time and within budget, developed and successfully applied an innovative design-build approach to project execution, and successfully managed cyclic MWR requirements to the available sources of funds to construct new projects.

The resources used to construct new facilities (or renovate existing ones) are declining, but the requirement for NAFMC will likely grow. While enough resources have been available to construct most financially viable MWR requirements, in the future most requirements will go unmet. In this new and challenging business environment, CFSC and its customers must work together to ensure that all NAFMC resources are utilized wisely. Only those projects in direct support of strategic goals should be funded, and those projects that are approved must be delivered efficiently, on time, and at a reasonable cost, thus preserving resources for future priorities. The CFSC understands the new business environment in which it must operate and has recently drafted a vision statement demonstrating a commitment to meeting the challenges ahead:

We are committed to achieving a greater good in America's Army by managing a world-class MWR construction program that

- *leads the industry with innovative design and construction techniques and processes,*
- *delivers the right facility within budget and on time,*
- *constructs state-of-the-art, high quality, and environmentally responsible facilities,*
- *provides high value to the users and promotes installation self sufficiency, and*
- *enhances quality of life.*

Service excellence and responsiveness to soldiers and their families is our mandate.

In addition, the CFSC has articulated specific and ambitious performance measurements for delivering NAFMC projects in the future. The following are examples:

- The functional and operational quality of the facility should satisfy at least 90 percent of its customers.
- At least 90 percent of all NAFMC projects should be delivered within the program amount, and no projects should exceed 125 percent of the program amount.
- All completed facilities should operate within 10 percent of PVA estimates by the end of the second year.
- At least 95 percent of the projects should be completed (and ready for occupancy) within 30 months of the final program submission.
- All facilities should be energy efficient, constructable, and maintainable and should have reasonable operating costs compared to private industry.
- The general and administrative costs associated with the NAFMC program should be reduced by 20 percent within two years and 30 percent within four years.

We support CFSC's commitment to change and, in this chapter, we present our conclusions concerning the delivery of NAFMC projects and recommend actions that CFSC can take to improve program planning and management, reduce process cycle time, reduce the staff effort associated with delivering projects, and otherwise help CFSC to attain its ambitious performance goals and its vision of a world-class MWR construction program. We also establish short- and long-term strategies for implementing specific improvement opportunities.

CONCLUSIONS

Overall, the process that CFSC has adopted to deliver NAFMC projects is an effective one. Because the NAFMC project delivery process has evolved and been streamlined over the years, CFSC is now able to manage a typical project requirement from project identification to construction start in just 30 months using the design-build approach and 38 months using the design-bid-construct approach. CFSC is quicker and more efficient than other construction agents working under the MILCON system, which can take five years or more before construction begins. However, CFSC's job is becoming increasingly difficult. With current and future cost-containment pressures, military downsizing, shrinking budgets, and fading MWR business revenues, CFSC must now bring about further improvements to an otherwise good project delivery system. The following subsections present our conclusions concerning some specific areas in which CFSC could improve.

Program Development

The program development phase, which includes all tasks from the time a need is identified through the program approval at the CRB meeting, takes 15 months to complete and requires 1.3 person-years of CFSC staff effort. The process is too long and too costly and should be simplified and streamlined to reflect CFSC's new business challenges. Today's NAFMC program development process evolved from a time when sufficient resources were available to complete nearly all financially viable MWR requirements. Currently, an unconstrained list of projects are identified by the users, financial performance and market conditions are validated for all reasonable projects, AMWRF and IMWRF resources are certified for those projects by CFSC, all valid requirements are consolidated at the MACOMs and briefed to the CRB, and the NAFMC program is finally pared down to meet the proposed NAFMC budget before it is finalized and submitted for upper echelon and congressional reviews. Attempting to manage all project requests wastes resources and staff time at all levels.

In the future, not enough resources will be available to construct all the valid requirements identified by the users, so CFSC should not continue to develop and finalize the program and validate projects as if it were. CFSC must modify the current program development process to identify the high priority projects early in the process and to ensure that only the Army's highest priority projects are funded. First, users at the installations and MACOMs will need an inexpensive and efficient way to distinguish those projects that will meet financial performance objectives and otherwise have the best chance of being approved by the CRB and upper echelons. Second, only those highest priority projects should be subjected to PVAs; doing so will minimize the total cost of conducting the assessments. Third, CFSC will need to change the process by which MACOMs consolidate their NAFMC requirements and present them to the CRB. Also, the conduct, timing, and composition of the CRB will need to reflect the needed changes in program development. Finally, a new NAFMC project prioritization policy will need to be developed and adopted by the installations, MACOMs, CRB, and CFSC to ensure that the Army's highest priority projects are effectively identified effectively early and then become part of the final NAFMC program submitted for review to the upper echelon of the Army and Congress.

Until recently, CFSC and the CRB have not had to limit valid MWR business opportunities competing for funds from the AMWRF, primarily because there were usually adequate resources to construct almost all financially viable projects. Starting with the FY94 NAFMC program, however, the sources of funding will not meet the demand for new projects. The establishment of priorities for funding projects is now essential so that available AMWRF resources are spent on Army's highest priority MWR projects. Previous attempts at developing and implementing a prioritization matrix or model for the CRB have failed because, at the CRB meeting, what counts are the priorities established by the MACOMS not by a model.

It is difficult to find fault with such an approach when it is the MACOMs that supposedly represent the best interests of the soldiers. However, that

approach will become increasingly ineffective as AMWRF and IMWRF resources continue to dwindle and the effective utilization of the resources that are available becomes increasingly important. The MACOMs and users will be better served and the program development activity improved by allowing the MACOMs to prioritize their own projects within a funding ceiling established by CFSC and the BOD finance committee. Working within their NAFMC funding allocations, MACOMs can use the project prioritization methodology presented in Appendix G to aid them in assessing and prioritizing projects from their unconstrained list of requirements that they want to eventually submit to the CRB. By knowing the approximate amount of NAFMC resources available to them and ranking projects using a methodology common to every MACOM and the CRB, MACOMs will be able to determine the best use of their limited funds before the CRB meets. Such an approach will also reduce the number PVAs that MACOMs must pay for because PVAs will be required only on those projects that the MACOMs consider their highest priorities and are most likely to be approved by the CRB.

Because many factors contribute to the success (or failure) of a project, the project prioritization methodology also will be necessary to aid the CRB members in the sophisticated problem of making objective and consistent evaluations of projects across a wide variety of locations, facility types, market characteristics, user characteristics, and ROI projections. The CRB, which historically has not ranked projects, will be able to use the matrix as a tool to validate the results of the MACOM prioritizations using their same methodology and to help reach consensus on projects at the funding margin.

Project Validation Assessments

Congress has made it clear that all NAFMC projects must have a market analysis and financial performance assessment performed by an independent contractor. The typical PVA takes five to six months to complete and costs between $30,000 and $40,000, which is fairly reasonable. However, in total, it costs too much to perform PVAs for all proposed MWR project requirements, especially on those projects that have little chance of being funded. Also, the 3.25 person-years of CFSC's staff effort required to manage the PVA program is excessive.

The CFSC has already streamlined various aspects of the PVA process by creating a shortlist of PVA contractors on indefinite-delivery contracts and is currently reengineering the PVA process to streamline it further. CFSC's goal is to reduce the time required for a PVA to 120 days (about four months). While it will be difficult to reduce further the cycle time or cost of performing a PVA, it will still be possible to minimize the total cost of performing PVAs by reducing the number of PVAs that are performed. Today, MACOMs and installations use their IMWRF to fund PVAs for almost all their NAFMC requirements regardless of the likelihood that those requirements will be funded. They do so because the PVA contractor's report and final results are required before any project can be considered for full project funding by the CRB and BOD. As a result, hundreds

of thousands of dollars will be spent on PVAs for projects that stand little or no chance of being funded. A project prioritization model that installations and MACOMs can use with existing data and that ranks projects before PVAs are conducted will eliminate much of the current waste of valuable IMWRF resources. The resulting savings could be enough to fund one or two projects every couple of years from IMWRF savings alone.

Cost Estimates

Today, USACE prepares the cost estimates for all NAFMC projects during the PVA process. Those estimates serve as the basis for the financial analysis and later as the project cost estimate for programming, budgeting, and approvals. Inaccurate or poorly performed facility cost estimates could potentially throw off the entire financial justification for an MWR business concern, particularly when the estimate does not reflect the actual scope of the project.

The perception within CFSC is that USACE estimates cost too much and are often inaccurate and that USACE is unresponsive to CFSC's concerns. Based on industry norms, CFSC should expect USACE to prepare, within one to two weeks, an estimate that is accurate within a 10 percent margin of error as long as the project scope is initially clear and not significantly modified after cost estimates are completed, labor or material costs do not fluctuate unexpectedly, estimators adequately address existing site conditions, and estimators use system/assembly estimating techniques based on standard industry practices to estimate the costs. Because USACE has been preparing estimates for CFSC for only two years, insufficient data exist to enable a statistical evaluation of USACE's accuracy. Currently, USACE's estimates appear to meet industry standards for accuracy. Also, we found that USACE's charges and the time it takes to perform its preliminary facility estimates are well within private-industry standards.

However, this is not to say that the USACE cost-estimating accuracy, costs, and responsiveness cannot be improved. By securing a single accountable USACE district to perform all NAFMC facility cost estimates, CFSC can ensure that at least one district will gain the specific knowledge and experience it needs to improve the accuracy of the estimates. Also, a single-source relationship should lower estimating costs and reduce turnaround times as the district gains experience with NAFMC projects. After a single district has time to learn the MWR facility construction business and prepares a number of estimates, CFSC should reevaluate the accuracy, responsiveness, and costs of the facility cost estimates to determine if other cost-estimating sources would be advisable.

Construction Review Board

The use of the prioritization methodology described earlier is essential for ensuring that only high priorities are considered and approved by the CRB in an orderly and efficient manner. The CRB must make sure that only the Army's top

MWR facilities are constructed and that the "final" program approved by the CRB has a high likelihood of passing the BOD and upper echelon reviews and approvals with little or no change or disruption. Changes to the "final" program cost time and effort.

Programs approved by the CRB have not always remained intact as they worked their way through the politically charged reviews by the Army and DoD leadership. At those later stages in the process, projects are sometimes deleted from the program. Typically, projects are deleted because the Army and DoD leadership has information or other insight that is not available to members of the CRB. This problem could be solved by inviting cognizant representatives of ASA(IL&E), who are aware of Army and DoD strategic planning positions, to the CRB and giving them voting authority. A final NAFMC program that has the concurrence of voting members from ASA(IL&E) will stand a better chance of being approved by those bodies.

To further minimize disruption and change to the approved NAFMC program, the time between the CRB meeting and the HASC MWR subpanel review should be minimized. Reducing the time between those two events will decrease the likelihood that external events will impact the approved program. Because the BOD meeting is fixed in March, the latest possible time for a CRB meeting would be toward the end of February. The meeting must be planned to permit reasonable time to update DD 1391s resulting from the CRB reviews before the BOD meets. However, that still leaves nearly seven months in which the approved NAFMC program will be subject to disruption and possible changes before the HASC MWR subpanel meets.

Reviews and Approvals

The NAFMC program approval process currently takes seven months from the CRB meeting to HASC MWR subpanel approval and involves no less than eight distinct review and approval stages. It takes nearly four CFSC staff-years of effort to manage the review and approval process, and at every stage, there is the risk that the final and approved CRB program will be modified, or at least, the completed DD 1391s will have to be modified. Clearly, far too much staff effort and time is required, so this process needs to be simplified. In particular, two steps in the review and approval process, the technical and the CRRC reviews, are the byproducts of an outdated project approval system and can be simplified or eliminated.

The CRRC review, required by Army regulation, is a remnant of a system in which USACE reviewed and approved all Army military construction, including construction of all MWR facilities. However, as the MWR program grew, CFSC assumed an oversight and project management role. Now, the CRRC review duplicates work already being done by CFSC. Likewise, the technical review is a requirement established by Army regulation that seemed reasonable when all project cost estimates, were performed by the PVA contractor and not by a USACE district. The technical review was then used to validate the

reasonableness of the PVA contractor's project cost estimate given the military environment in which the project was to be constructed. Today, all NAFMC project estimates are performed by USACE districts, and the technical review has become a redundant review of the district's estimate by headquarters.

Other reviews, particularly those of the BOD executive committee and the BOD finance committee, are of questionable value. They should be examined further to determine how they can be simplified.

Eliminating the CRRC review and the USACE technical review will reduce the CFSC oversight effort and save review and approval process time. However, unless the BOD can be moved closer to the HASC MWR subpanel review, the savings will have no impact on the overall project duration.

Project Execution

With respect to project execution, the CFSC has already taken steps in the right direction. It has developed and put into practice an innovative and effective means for delivering projects using a design-build approach whenever it is feasible to do so. Managed by in-house staff, that approach has proven to be an efficient means for delivering NAF projects, taking just 30 months from project identification to construction start, and gives CFSC other benefits. Design-build:

- significantly reduces the amount of time needed to move NAFMC requirements from project approval to construction,
- minimizes the need for procurement activities (only one contractor acquisition is needed instead of the two or three required by traditional approaches),
- provides for a single point of contact for problem resolution and places more and singular responsibility on the design-build contractor,
- relieves CFSC from the role of quality control and places that function on the contractor,
- increases the likelihood of completing projects on time and within budget while using fewer in-house resources to manage, and
- permits contractors to resolve most design-related problems internally without CFSC or USACE interventions and therefore significantly reduces the number of contract modifications (except those relating to differing site conditions) and legal conflicts.

The design-build approach is growing quickly in the private sector and in other public enterprises and represents the state-of-the art in project delivery. Because design-build represents a more "business-like" approach to project delivery, Congress and the Army leadership encourage its application within the

MWR major construction program. For those reasons, USACE has also begun testing more innovative construction delivery approaches such as design-build. Facility owners in the private sector also prefer the design-build approach over the traditional approaches because it saves time and money and increases the chance that they will get the building they want. Also, design-build reflects many of today's business ideals such as just-in-time delivery, business partnering, risk-shifting, outsourcing, and total quality management.

For all those reasons, CFSC should continue to use the design-build approach on all projects when it is feasible to do so and should continue to manage as many of those projects as its in-house resources will permit. We believe that CFSC's in-house staff is capable and highly motivated to manage project times and costs effectively. However, there is still some uncertainty concerning future NAFMC program amounts and the mix of projects (domestic versus overseas, new construction versus renovation, and design-build versus design-bid-construct). Therefore, CFSC should keep its in-house project management staffing at current levels and offload all the NAFMC project management beyond its current in-house capability to the USACE.

Regardless of future NAFMC program size, USACE will continue to play an integral role in the delivery of MWR facilities. First, CFSC does not have the organizational resources or infrastructure to manage the execution of projects outside the continental United States, whereas USACE has an international infrastructure already in place. Second, USACE is better suited to execute large, complex renovation or revitalization projects requiring the design-bid-construct approach. Because future NAFMC programs will include some overseas and renovation projects and projects costing less than $1.5 million for which the design-build approach is not suitable, CFSC will continue to need USACE support.

However, the current policy of selecting local or available USACE districts for each NAFMC project is an ineffective one. Often, because of their small size and low construction cost (in relation to other district projects), NAFMC projects do not get the priority that CFSC believes they deserve. In addition, many USACE project managers and engineers are unfamiliar with CFSC's unique approach to design-build execution, so they must be trained by CFSC each time a NAFMC project is awarded to districts that are unfamiliar with that approach. In addition, a seemingly high turnover of USACE project managers already trained by CFSC increases training costs because their replacements must then be trained. CFSC would be better served if all work tagged for execution by USACE were placed with a single district where the design-build expertise and responsibility could be concentrated and allowed to prosper.

Such an approach can be achieved by establishing a captive business relationship with a single USACE district. The partnership, which could be established through an MOA between CFSC and the selected USACE district, would increase CFSC's overall influence because the workload would represent a sizable proportion of a district's overall workload, thereby improving CFSC's importance to that district. The potential benefits gained through a USACE

partnership are numerous. Such an arrangement will help smooth peaks in workload and unexpected variations in domestic and overseas work, design-build and design-bid-construct work, and renovation and new construction work. In addition, the MOA could establish flat rates for USACE-managed projects, which would eliminate much of the fund certification activity and should reduce the costs of services to CFSC. This business relationship has the potential to reduce all costs associated with supervision and review (S&R) during project design, supervision and administration (S&A) during project construction, and facility estimates because the single USACE district will be able to establish fixed rates based on levels of services provided.

Because the same USACE district and personnel would be providing services for CFSC, these persons will gain the expertise, knowledge, and skills that should lead to the quality and consistency of service that CFSC is seeking. Responsiveness should improve because a single, accountable district would have far greater incentive to meet CFSC's requirements, the business relationship would be more stable, and mutual expectations and responsibilities would be known by both parties. Also, the selected USACE would have increased incentive to train its personnel in CFSC's project management methods for design-build projects, which would then reduce CFSC's training costs. It should also reduce the turnover of trained NAFMC support personnel at the district because, with a larger and more viable program, USACE personnel will now be able to specialize in MWR construction, applying their skills on an ongoing basis and gaining proficiency in delivering these facilities.

RECOMMENDATIONS

While CFSC has adapted well over the years to a changing business climate, cyclic program requirements, and changes in NAFMC funding levels, opportunities still exist to make further improvements to the NAFMC program development and project execution processes. CFSC can modify the program development process to ensure that only the Army's highest priority projects are funded, eliminate redundant program and project reviews, minimize the potential for changes to the "approved" program, reduce project validation and estimating costs, reduce the costs for, and improve the responsiveness of, project management activities from USACE, and streamline or eliminate all nonproductive activities. To maximize the use of its AMWRF resources and in-house staff, CFSC should implement the following specific recommendations:

- *Establish a business partnership with one or two USACE districts to manage the execution of selected NAFMC projects.* Consolidating all NAFMC projects that must be executed by USACE at a single district will establish a framework for lowering project delivery costs and give CFSC the influence it needs to ensure quality, responsiveness, and cost-effective service. Also, establishing project management responsibility at a single district will mean that a center of expertise for NAFMC execution can be developed and CFSC will not be required to continually train USACE personnel. By employing an informal competition among several candidate districts, CFSC can select the one or

two that can meet CFSC's requirements for quality, costs, and responsiveness. CFSC and its new business partners should then draw up a new MOA that would serve as the foundation to the new business partnership. The MOA should clearly identify the district's responsibility for turnaround times, accuracy and price of project estimates, S&A rates, S&R rates, and other administrative and project management requirements. Working with the partner candidates, CFSC should establish and include rates that are reasonable for both their partner and for CFSC. The MOA should also include an agreement on reducing the number of cost categories that CFSC will track on future projects.

- *Develop and implement a new policy for allocating project funding among the MACOMs.* In the coming years, the number of NAFMC project requirements will most certainly exceed the availability of AMWRF and IMWRF funds to construct them. Therefore, it is important minimize the time, effort, and money spent during program development by simplifying the process. This can be achieved by allocating a portion of the next year's total MWR construction program to each MACOM during the CRB meeting. The policy will permit the MACOMs to establish their priorities within their funding limitations early in the process. Because only a fraction of the MACOMs' total requirements will be considered, staff support will be reduced and less money will be spent on PVAs, particularly on those projects that have little chance of ever being funded. To ensure that the Army's highest priorities are being considered, CFSC should develop and have the MACOMs and the CRB begin using a newly developed project prioritization methodology (Appendix G provides a suggested matrix of criteria and weighting factors). The new methodology should rely on automation to simplify its use by the MACOMs, CFSC, and CRB.

- *Modify the format, timing, composition, and conduct of the CRB meeting.* CFSC should modify the conduct of the CRB meeting to make it more responsive to the new MWR business climate. Not every NAFMC requirement should be briefed at the CRB; instead, only high-priority projects identified by the MACOMs that are within their funding allocation should be briefed. The CRB's responsibility then will be simply to validate the MACOMs' short list of NAFMC requirements and those projects at the funding margin. Additionally, the CRB meeting should be moved as close as possible to the HASC MWR subpanel meeting to minimize disruption and changes to the CRB approved NAFMC program. While changes to the program will always be a political reality, CFSC can improve the likelihood that the final NAFMC program will make it through the upper echelon reviews and approvals remain intact by including a representative from ASA(IL&E) as a voting member.

- *Streamline and automate, where practical, the NAFMC program delivery processes.* CFSC delivers projects expeditiously and, without major concessions from Congress, cannot make dramatic reductions to the current cycle time. However, time can be shaved from the current process, and CFSC can reduce the total amount of staff and external effort needed to develop and execute the

modifying others, and automating wherever practical. For example, review and approval steps such as the CRRC and technical reviews are no longer functioning as intended, so they can be significantly modified or eliminated. Appendix F presents a proposed timeline for the major activities for delivering NAFMC projects using both construction execution approaches; that timeline begins with identifying the need for a project and ends with the users occupying the facility and closing out the project financially. Other areas that CFSC should address are as follows:

- *CFSC should simplify and automate the funds certification process where possible.* Much of the fund certification effort will be greatly reduced after CFSC and a single USACE district join forces, thus reducing the number of fund categories. However, the certifications required in other areas can be further streamlined by adopting automated practices. One feature would permit electronic data interchange between CFSC and USACE and its other customers.

- *Assume responsibility for producing the Greenbook.* CFSC has ownership of the NAFMC program; therefore, it, instead of USACE, should be responsible for preparing the Greenbook. This change should reduce the amount of errors and rework and therefore reduce cycle time in the program development and approval process. Preparation of the Greenbook is an excellent opportunity for automated processing.

- *Develop and distribute educational material to the field which explains the proper procedure for preparing the DD 1391 documentation.* DD 1391 preparation is important and must follow the prescribed format. Many DD 1391s are prepared improperly, and as a result, CFSC spends far too much effort reviewing and correcting those that are unsatisfactory. The cycle of reviewing DD 1391s, returning them to the initiator for correction, resubmitting them, and reviewing them again delays the timely development of the NAFMC program. The educational materials can take the form of simple brochures or videotapes and should emphasize the importance of properly prepared DD 1391s, along with step-by-step instructions on effectively completing the forms and accomplishing the required backup. It is also possible to develop a DD 1391 expert system that can make the development process easier for the users.

- *Design, develop, and implement a management information system for NAFMC projects.* The primary purpose of this system will be to automate NAFMC project management and thus, enable CFSC's in-house staff to meet the ambitious schedule and resource constraints recommended in this report. Another key feature of this system is a data base that will monitor project data. A data base will aid postoccupancy assessments, cost-estimation analysis, and other long-term needs for information.

IMPLEMENTATION STRATEGIES

The improvement opportunities recommended by LMI and sanctioned by the CFSC PAT have a number of important implications for change that must occur if the proposed NAFMC project delivery process is to achieve the stated performance goals. Those necessary changes must be planned effectively and carried out by the responsible parties in a logical sequence to ensure that maximum benefits are achieved. LMI recommends a phased implementation strategy that will produce the greatest number of improvements quickly. Some short-term changes represent "quick fixes" and should not require significant time or resources. Others will require support from outside organizations and active and ongoing effort from CFSC. Table 4-1 presents those required actions along with responsible organizations and achievement goals.

Table 4-1.
Implementation Strategy: Short- and Long-Range Changes

Required change	Responsible activity	Goal
Eliminate or modify CRRC review	CFSC-COP	As soon as possible
Eliminate or modify technical review	CFSC-COP	FY96 program
Eliminate or modify BOD review; delegate authority to BOD executive committee	CFSC/SPC/executive committee	Next BOD meeting
Eliminate or modify BOD finance committee review	CFSC-RM	FY96 program
Establish funding ceiling that each MACOM submits to CRB	CFSC/SPC/BOD finance committee	By next CRB meeting
Move annual CRB meeting to November to reduce project review period	CFSC-CO/SPC; notifies MACOM	Next program guidance
Prioritize projects submitted to CRB (use same prioritization matrix as CRB)	CFSC-COP; sends guidance to MACOMs	Next program guidance
Change five-year NAFMC plan to three-year plan to correspond to the TNA	CFSC-COP/MACOMs	Next program guidance
Allocate slots in the DD 1391 training course for NAF construction personnel from the installations and MACOMs or develop a course specifically for NAF construction personnel	USACE and CFSC-COP; investigate current availability of slots in courses; notify MACOMs	Investigate and resolve by 1 Nov. 94
Establish business partnership with a single district	CFSC and USACE	FY95 or FY96
Design, develop, and implement NAFMC MIS to automate funding certification process and track project data	CFSC and Phase II committee to MIS steering committee	Begin by FY95; complete by FY96
Reduce number of cost categories in funding certification on USACE projects	CFSC-CO and USACE	Ongoing
Take responsibility for publishing Greenbook	CFSC/USACE/HQDA	FY96 program
Implements education program about new NAFMC process	Phase II committee/SPC	Begin in FY94; complete in FY95
Develop project prioritization matrix	Phase II committee/SPC	Test FY96 program; finalize FY97 program
Improve guidance and template for calculation of ROI and income statement	CFSC-RM	FY96 program
Incorporate executive summary format into PVA SOW	CFSC	FY96 program

Note: SPC = Strategic Planing Committee, MIS = Management Information System.

Glossary

AAFES	Army and Air Force Exchange Service
ABC	activity-based costing
ACS(IM)	Assistant Chief of Staff (Installation Management)
A-E	architect-engineer
AMWRF	Army MWR fund
APF	appropriated funds
AR	Army regulation
ARM	Army Recreation Machine
ASA(IL&E)	Office of the Assistant Secretary of the Army (Installations, Logistics, and Engineering)
ASA(M&RA)	Assistant Secretary of the Army (Manpower and Reserve Affairs)
BOD	Board of Directors
BRAC	base realignment and closure
CAPCES	Construction Appropriations Programming, Control and Execution System
CFSC	Community and Family Support Center
CFSC-BP	Community and Family Support Center, Business Program Directorate
CFSC-CO	Community and Family Support Center, Construction Directorate
CFSC-COE	Community and Family Support Center, Construction Directorate, Engineering and Construction Branch
CFSC-COP	Community and Family Support Center, Construction Directorate; Plans, Policy, Programming, and Administration Branch

CFSC-CR	Community and Family Support Center, Community Recreation Directorate
CFSC-FS	Community and Family Support Center, Family Support Directorate
CFSC-NC	Community and Family Support Center, Contracting Directorate
CFSC-PN	Community and Family Support Center, Plans and Policy Directorate
CFSC-RM	Community and Family Support Center, Resource Management Directorate
CPM	critical path method
CRB	Construction Review Board
CRRC	Construction Requirements Review Committee
DASD(PSF&E)	Deputy Assistant Secretary of Defense (Personnel Support, Family, and Education)
DPCA	Directorate of Personnel and Community Activities
FAR	Federal Acquisition Regulation
HASC	House Armed Services Committee
HQDA	Headquarters, Department of the Army
IDEF	ICAM (Integrated Computer-Aided Manufacturing) **DEF**inition language
IDQ	indefinite quantity
IMWRF	installation MWR fund
LMI	Logistics Management Institute
MACOM	major Army command
MILCON	military construction
MOA	memorandum of agreement
MWR	morale, welfare, and recreation

NAF	nonappropriated funds
NAFMC	NAF major construction
NAVFAC	Naval Facilities Engineering Command
PAT	process action team
PERT	Program Evaluation and Review Technique
PVA	project validation assessment
RFP	request for proposals
ROI	return on investment
S&A	supervision and administration
S&R	supervision and review
SOW	statement of work
TNA	Triennial Needs Assessment
USACE	U.S. Army Corps of Engineers

APPENDIX A

Model Methodologies

Model Methodologies

This appendix describes the tools we used to develop a detailed model of the current nonappropriated funds major construction (NAFMC) project delivery process. It also discusses our use of value analysis to assess how much of an organization's resources are being expended on activities that do not add value to the overall process of delivering a product or service.

We used the following four business process modeling tools:

- IDEF[1] activity models, which identify input and output flows
- Critical path method (CPM) charts, which are commonly used to identify not only the critical path in a process, including activity durations and cycle times, but the interrelationships and interdependencies of process activities
- Activity-based costing, which is used to assign costs to each significant activity in a process
- Value analysis, which is a process used to determine how much of an organization's resources are being expended on activities that do not add value to delivering a product or service.

The result was a detailed picture of the current NAFMC project delivery process, or project life cycle. The detailed model includes activity networks and quantitative data such as the duration and cost of each task in the process. We validated the results by comparing the major milestones identified in our model with various established and measurable events that occur at consistent times in the NAFMC program year, such as the Construction Review Board meeting, start and finish dates for project validation assessments, and the meeting of the House Armed Services Committee Morale, Welfare, and Recreation subpanel that reviews the NAFMC program.

The following subsections describe the modeling tools in greater detail.

IDEF Activity Models

The IDEF is a complete systems modeling methodology that resulted from the Air Force's program for Integrated Computer-Aided Manufacturing (ICAM) in the 1970s. That program focused on techniques to improve manufacturing productivity through the systematic application of computer technology. "The ICAM program identified a need to better communicate and analyze

[1] IDEF refers to ICAM (Integrated Computer-Aided Manufacturing) DEFinition Language.

manufacturing for the people involved in improving productivity. To satisfy that need, the ICAM program developed the IDEF method to address particular characteristics of manufacturing."[2]

The IDEF methodology has four major components: activity modeling (IDEF0), data modeling (IDEF1 and IDEF1X), dynamic process simulation (IDEF2), and activity-based costing (IDEF3). The basic goal of the IDEF methodology and techniques of implementation is to provide a common communication vehicle among the various parties involved with a process.

The IDEF0 component used in this study, the activity model, results in a static description, or map, of workflow. The IDEF model depicts the interrelationships among all of the activities in a process, but shows more detail at the lower levels in the hierarchy of activities. Each activity is referred to as a node. A node tree is a "top-level" outline of all activities constituting an activity model.

As shown in Figure A-1, the model documents the inputs and outputs (i.e., workflow) through activities, the mechanisms used to perform each activity, and the controls on each activity. The elements of the IDEF activity model are defined as follows:

- Activity – process, activity, or task that transforms an input into an output.
- Input – information or material used to produce the output of an activity. The input is altered or acted upon in some way to produce the output.
- Controls – rules that regulate the way inputs are transformed into outputs. These rules may regulate which, when, or how outputs are produced or whether outputs can be produced at all.
- Output – outcome of the transformed input.
- Mechanism – entity (person, machine, system, organization) used to execute the transformation of inputs into outputs.

In addition to developing a model of the current or "as is" NAFMC project delivery process, we used IDEF0 to develop the recommended or "to be" model of the NAFMC project delivery process.

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[2] Air Force Wright Aeronautical Laboratories, Report UM 110231100, *Integrated Computer-Aided Manufacturing (ICAM) Function Modeling Manual*, Materials Laboratory, Wright-Patterson Air Force Base, Ohio, June 1981, p. 1.

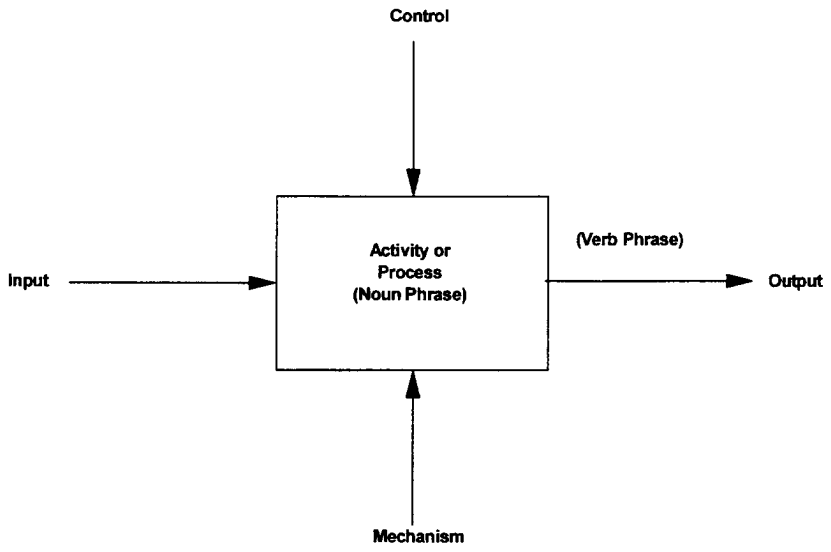


Figure A-1.
IDEF Activity Model Components

CRITICAL PATH METHOD CHARTS

The CPM is a system for planning, scheduling, and controlling a project. The steps or tasks necessary to finish a project are shown in a chart called a network. The network shows not only what tasks are required to complete a given project but the order in which the tasks must be completed — which tasks can be done simultaneously and which must follow one another.

Once a network is complete, the manager or planner can estimate how long it will take to complete each task. The time needed to complete the entire project may not necessarily be the sum of the individual tasks, since some things can be done at the same time. In fact, a small number of the tasks control the completion time of the entire project. These tasks are called critical operations and form a chain through the activity network called the critical path — thus, the origin of the name, critical path method.

Once the critical path is determined, a planner knows that any incremental delay in critical activities will delay the overall project duration by that same incremental delay.

There are many advantages to using a CPM chart in project management:

- It shows relationships, or the dependency, of one job to another.

- It improves planning, forcing project managers to think the job from beginning through completion.
- It pinpoints problem areas such as bottlenecks.
- It improves communication, providing a frame of reference for discussion between all parties.
- It optimizes resource allocation, enabling the planner to determine the most effective use of resources.
- It improves analysis of alternative courses of action, by providing management with an inexpensive means of simulating the outcome of different strategies.

Like CPM, the Program Evaluation and Review Technique (PERT) uses a combination of arrows and circles or boxes to represent a project. The arrows connect circles or boxes that represent individual jobs or tasks. Each point where arrows meet represents an event or an activity. Figure A-2 is an example of CPM graphical symbols that we used in our analysis.

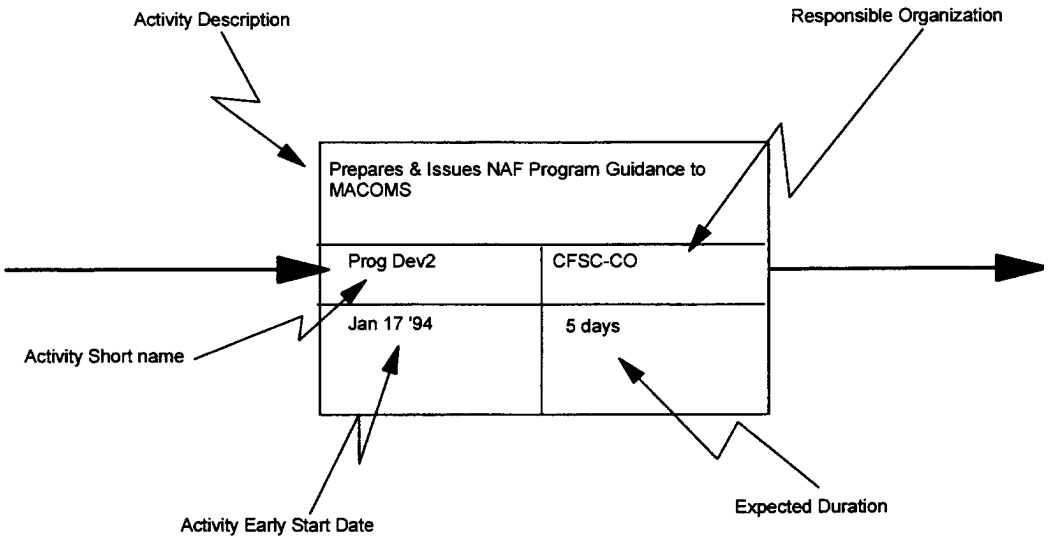


Figure A-2.
Sample CPM Graphical Symbols

Networks that emphasize events are said to be event-oriented and ones that concentrate on the activities between events are said to be activity-oriented. Originally, CPM networks were entirely event-oriented, but today activity-oriented networks are in such common use that there is no longer a real distinction. All the networks in this study are activity-oriented networks.

We developed activity networks for both design-build and design-bid-construct type projects. The result was a 144-task critical path network to model typical design-build projects and a 141-task network for design-bid-construct projects. Those activity networks are presented in detail in Appendices D and F.

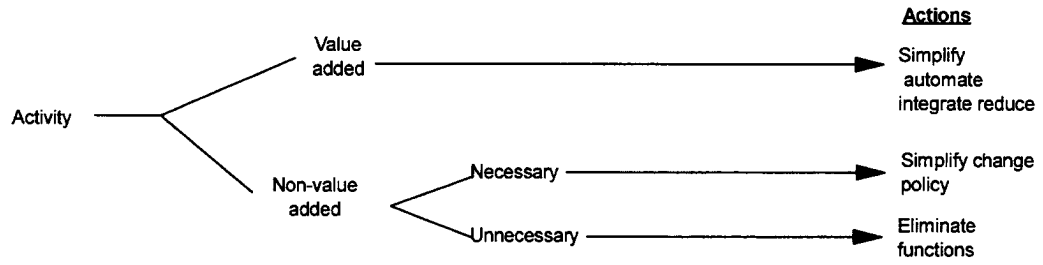
Activity-Based Costing

Activity-based costing, IDEF3, is a process-oriented, product-based methodology for assigning costs to activities in a process. That is, it associates the costs of activities in a process in a way that shows how an activity consumes resources. It focuses on activities associated with the major costs of delivering a product or service.

We used activity-based costing to relate the costs associated with delivering NAFMC projects directly to specific activities identified in the IDEF0 activity modeling sessions. The costing worksheet, depicted in Appendix C, is a matrix composed of the activities identified in the IDEF0 node tree on the vertical axis and the major participants within the Community and Family Support Center on the horizontal axis. The figures inside the matrix are approximate staff hours expended by a participant on a particular task. Total staff hours associated with each task also are shown.

Value Analysis

Value analysis is the process of assigning a value to each activity in a process. Activities are divided into two groups: those that add value to the end product or service and those that do not. Activities that do not add value to the process are further divided into those that are necessary to completing the process and those that are not. Value analysis enables one to assess how much of an organization's resources are being expended on activities that do not add value to the overall process of delivering a product or service. Figure A-3 illustrates the value analysis technique.



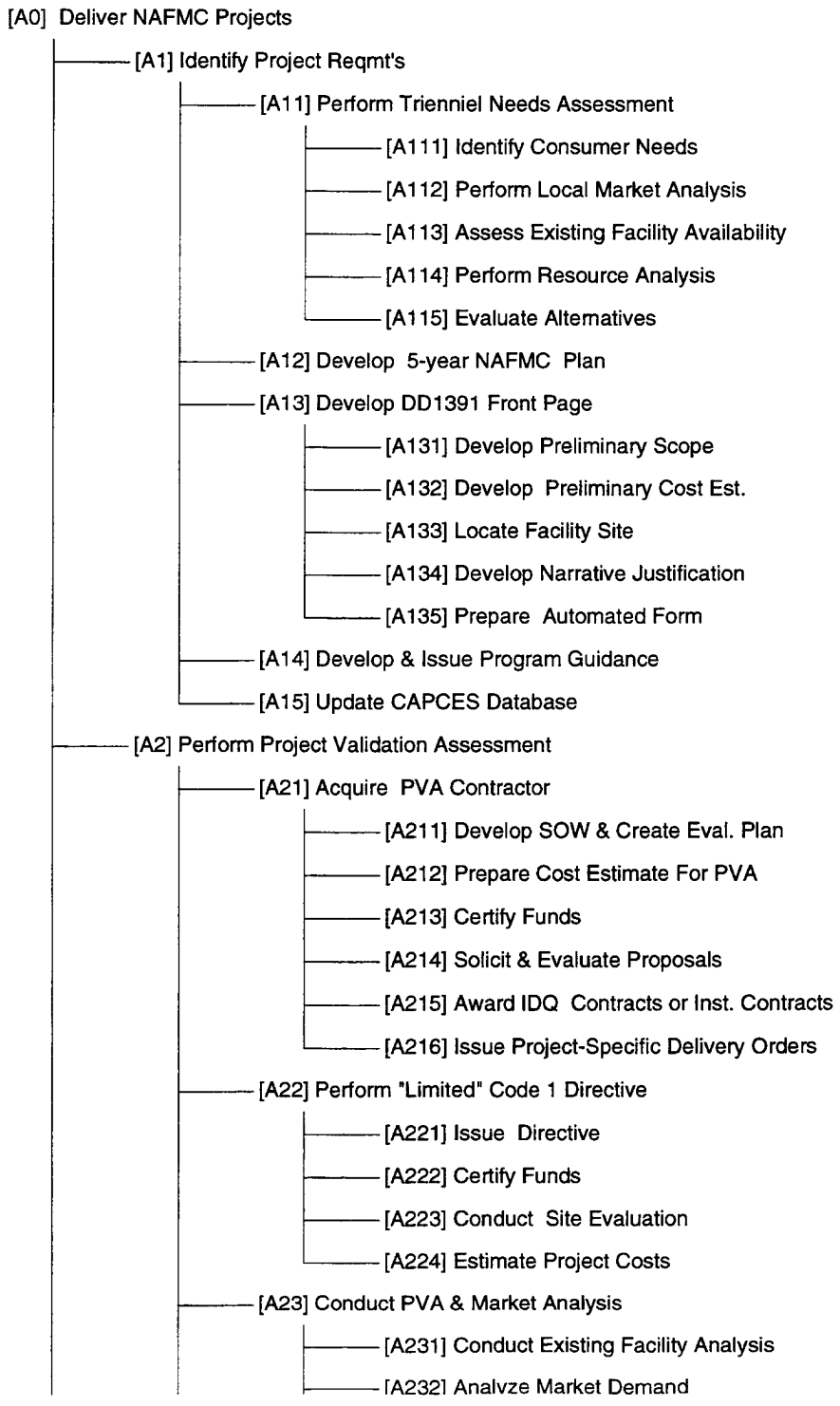
Value added:	Contributes value that customer will pay for
Non-value added:	Contributes value that a customer is NOT willing to pay for
Necessary NVA:	Necessary to completing the process
Unnecessary NVA:	Does not contribute value and is not necessary factor for completing the process

Figure A-3.
Value Analysis

APPENDIX B

"As Is" IDEF Activity Model of NAFMC Process

Node Tree for C:\IDEF\NEWMODS\NAFMC2.IDD



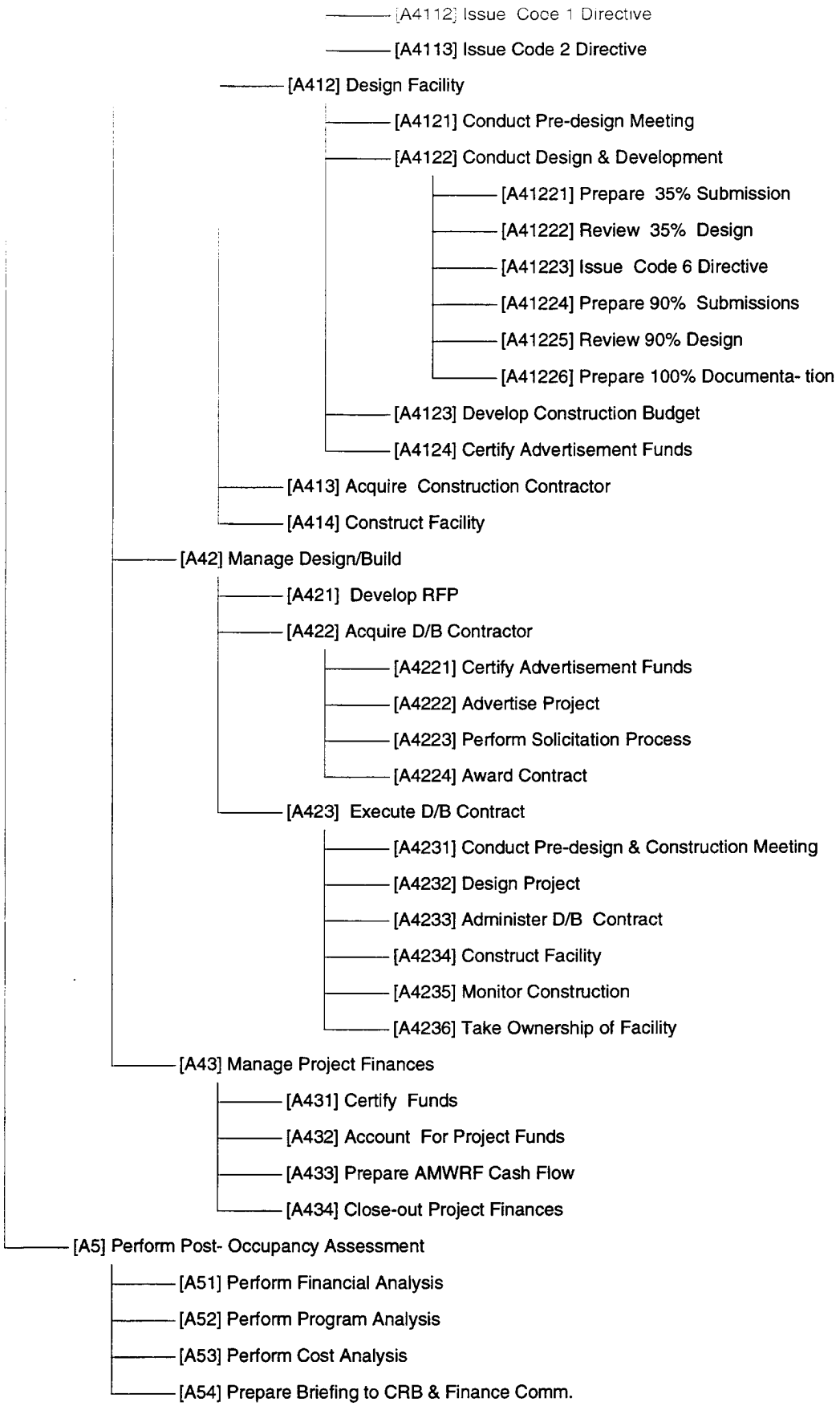
- [A232] Analyze Market Demand
- [A233] Perform Financial Analysis
- [A234] Analyze site & Surrounding Area
- [A235] Develop Project Scope
- [A236] Develop Viable Alternatives

- [A24] Prepare PVA Report
  - [A241] Prepare Draft Report
  - [A242] Coordinate & Review Draft Report
  - [A243] Finalize Report

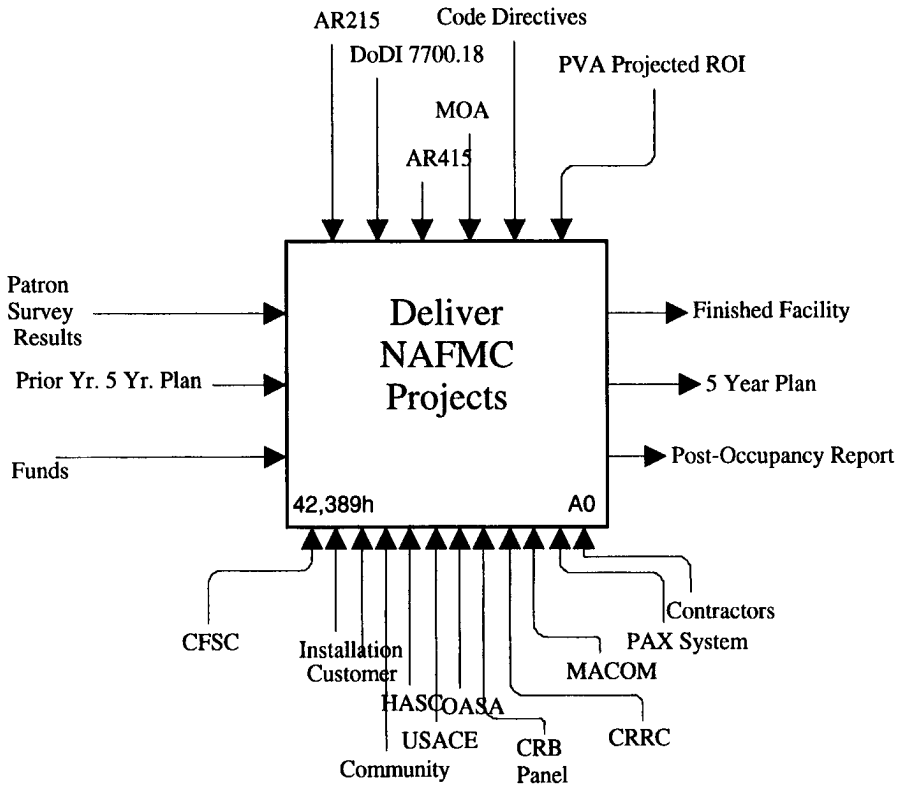
- [A25] Finalize DD1391
  - [A251] Confirm Project Scope
  - [A252] Confirm Costs
  - [A253] Confirm Siting
  - [A254] Complete DD1391
  - [A255] Approve & Submit

- [A3] Review & Approve NAFMC Projects
  - [A31] Perform MACOM- level Review & Approval
  - [A32] Conduct Army CRB
    - [A321] Generate CRB Letter of Instruction
    - [A322] Develop Project Briefings
    - [A323] Prepare CRB Read Ahead
    - [A324] Conduct CRB Meeting
    - [A325] Prepare CRB Meeting Minutes
    - [A326] Revise DD1391s
  - [A33] Perform CRRC Review
  - [A34] Perform Tech Review
  - [A35] Obtain Higher- Echelon Approval
    - [A351] Obtain ExCom Approval
    - [A352] Obtain BoD Approval
    - [A353] Obtain OASA Approval
    - [A354] Obtain OSD Approval
    - [A355] Obtain HASC Approval
  - [A36] Prepare "Greenbook"
    - [A361] Edit final DD1391s
    - [A362] Update CAPCES
    - [A363] Consolidate All Army NAF Projects
    - [A364] Generate Draft "Greenbook" Report
    - [A365] Review Draft Report
    - [A366] Produce Final Report

- [A4] Manage Project Execution
  - [A41] Manage Design/ Bid/Construct
    - [A411] Acquire A/E Firm
      - [A4111] Develop SOW
      - [A4112] Issue Code 1 Directive

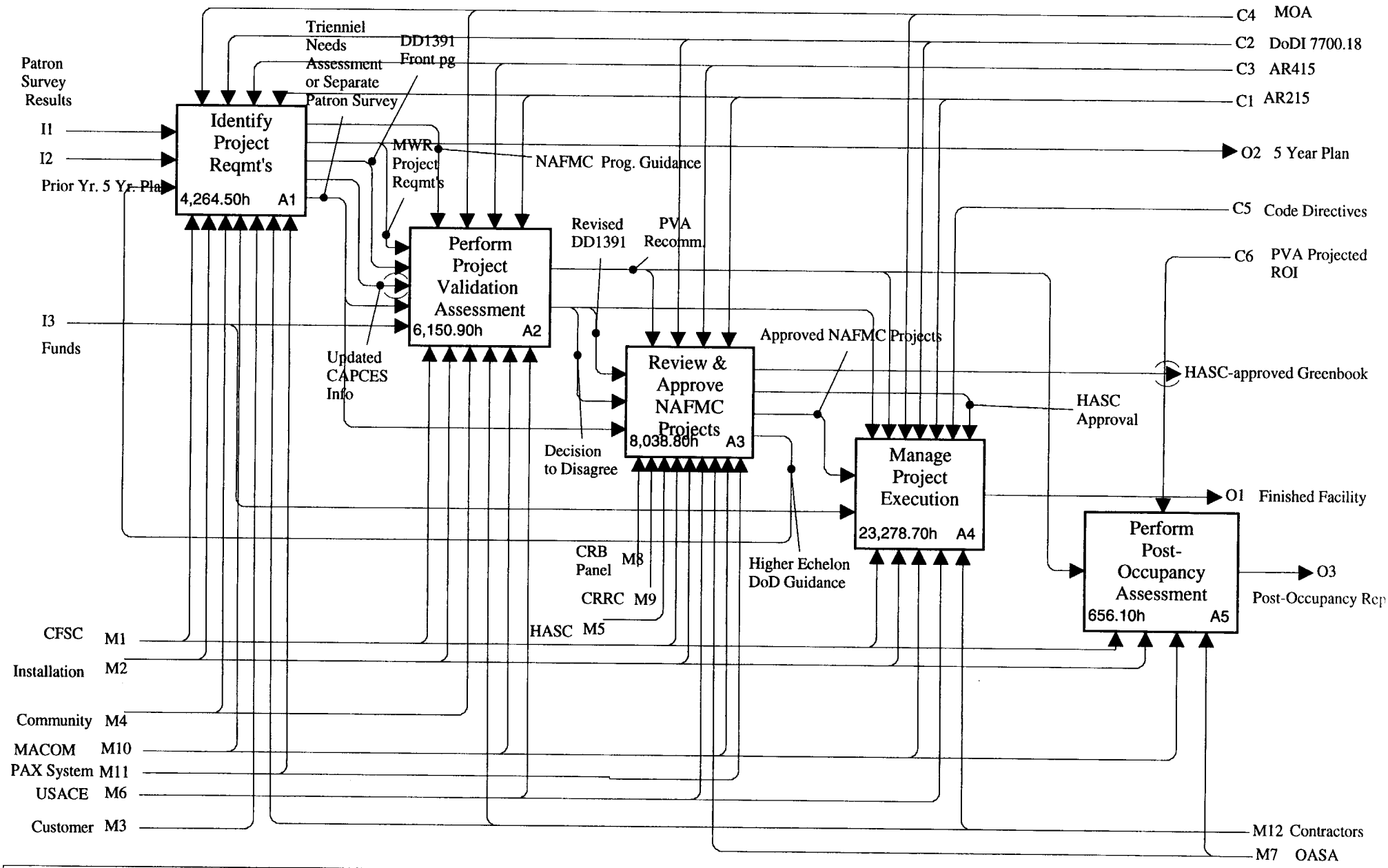

[A4112] Issue Coce 1 Directive
[A4113] Issue Code 2 Directive
[A412] Design Facility
[A4121] Conduct Pre-design Meeting
[A4122] Conduct Design & Development
[A41221] Prepare 35% Submission
[A41222] Review 35% Design
[A41223] Issue Code 6 Directive
[A41224] Prepare 90% Submissions
[A41225] Review 90% Design
[A41226] Prepare 100% Documenta- tion
[A4123] Develop Construction Budget
[A4124] Certify Advertisement Funds
[A413] Acquire Construction Contractor
[A414] Construct Facility
[A42] Manage Design/Build
[A421] Develop RFP
[A422] Acquire D/B Contractor
[A4221] Certify Advertisement Funds
[A4222] Advertise Project
[A4223] Perform Solicitation Process
[A4224] Award Contract
[A423] Execute D/B Contract
[A4231] Conduct Pre-design & Construction Meeting
[A4232] Design Project
[A4233] Administer D/B Contract
[A4234] Construct Facility
[A4235] Monitor Construction
[A4236] Take Ownership of Facility
[A43] Manage Project Finances
[A431] Certify Funds
[A432] Account For Project Funds
[A433] Prepare AMWRF Cash Flow
[A434] Close-out Project Finances
[A5] Perform Post- Occupancy Assessment
[A51] Perform Financial Analysis
[A52] Perform Program Analysis
[A53] Perform Cost Analysis
[A54] Prepare Briefing to CRB & Finance Comm.

USED AT:	AUTHOR: LMI	DATE: 6/05/94		WORKING	READER	DATE	CONTEXT:
	PROJECT: DELIVER NAFMC PROJECTS	REV: 2.0		DRAFT			Top
				RECOMMENDED			
	NOTES: 1 2 3 4 5 6 7 8 9 10			PUBLICATION			



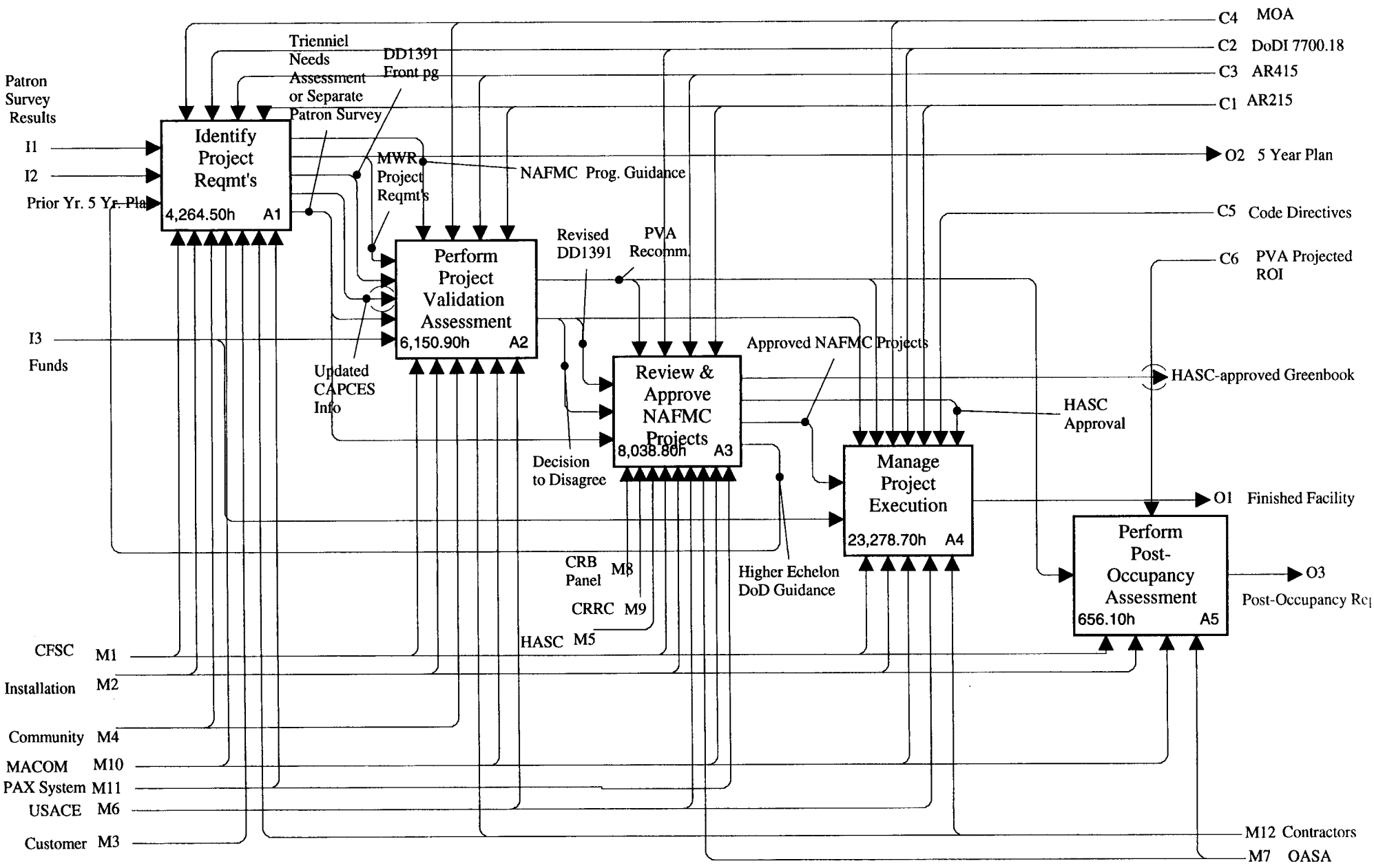
NODE: A-0	TITLE:	NUMBER:

USED AT:	AUTHOR: LMI	DATE:		WORKING	READER	DATE	EXT:
	PROJECT: DELIVER NAFMC PROJECTS	REV: 2.0		DRAFT			
	NOTES: 1 2 3 4 5 6 7 8 9 10			RECOMMENDED			
				PUBLICATION			



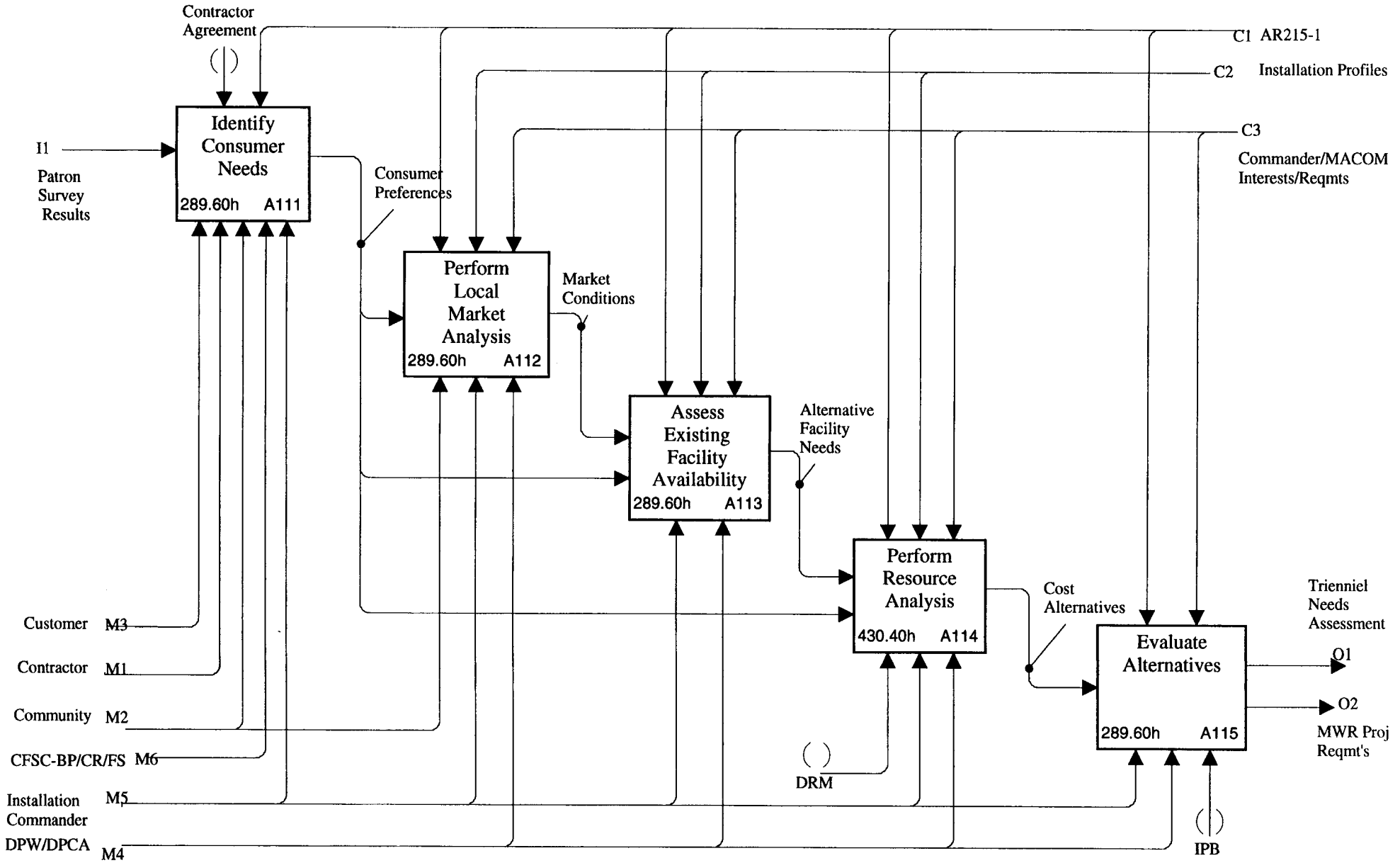
NODE: A0	TITLE: Deliver NAFMC Projects	NUMBER:

USED AT:	AUTHOR: LMI	DATE:		WORKING	READER	DATE	CXT:
	PROJECT: DELIVER NAFMC PROJECTS	REV: 2.0		DRAFT			
	NOTES: 1 2 3 4 5 6 7 8 9 10			RECOMMENDED			
				PUBLICATION			



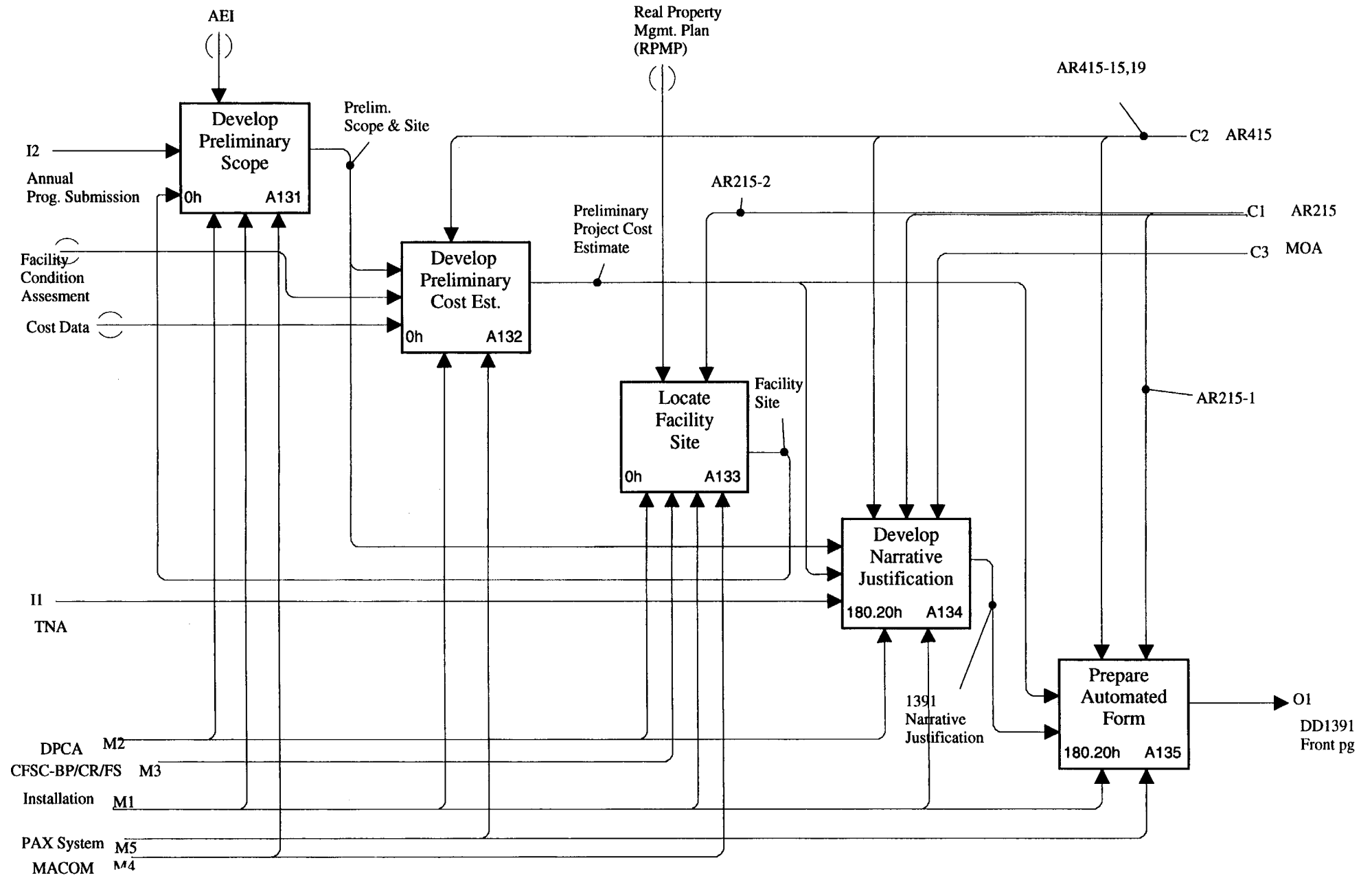
NODE: A0	TITLE: Deliver NAFMC Projects	NUMBER:

USED AT:	AUTHOR: LMI	DATE:		WORKING	READER	DATE	EXT:
	PROJECT: DELIVER NAFMC PROJECTS	REV: 2.0		DRAFT			
	NOTES: 1 2 3 4 5 6 7 8 9 10			RECOMMENDED			
				PUBLICATION			



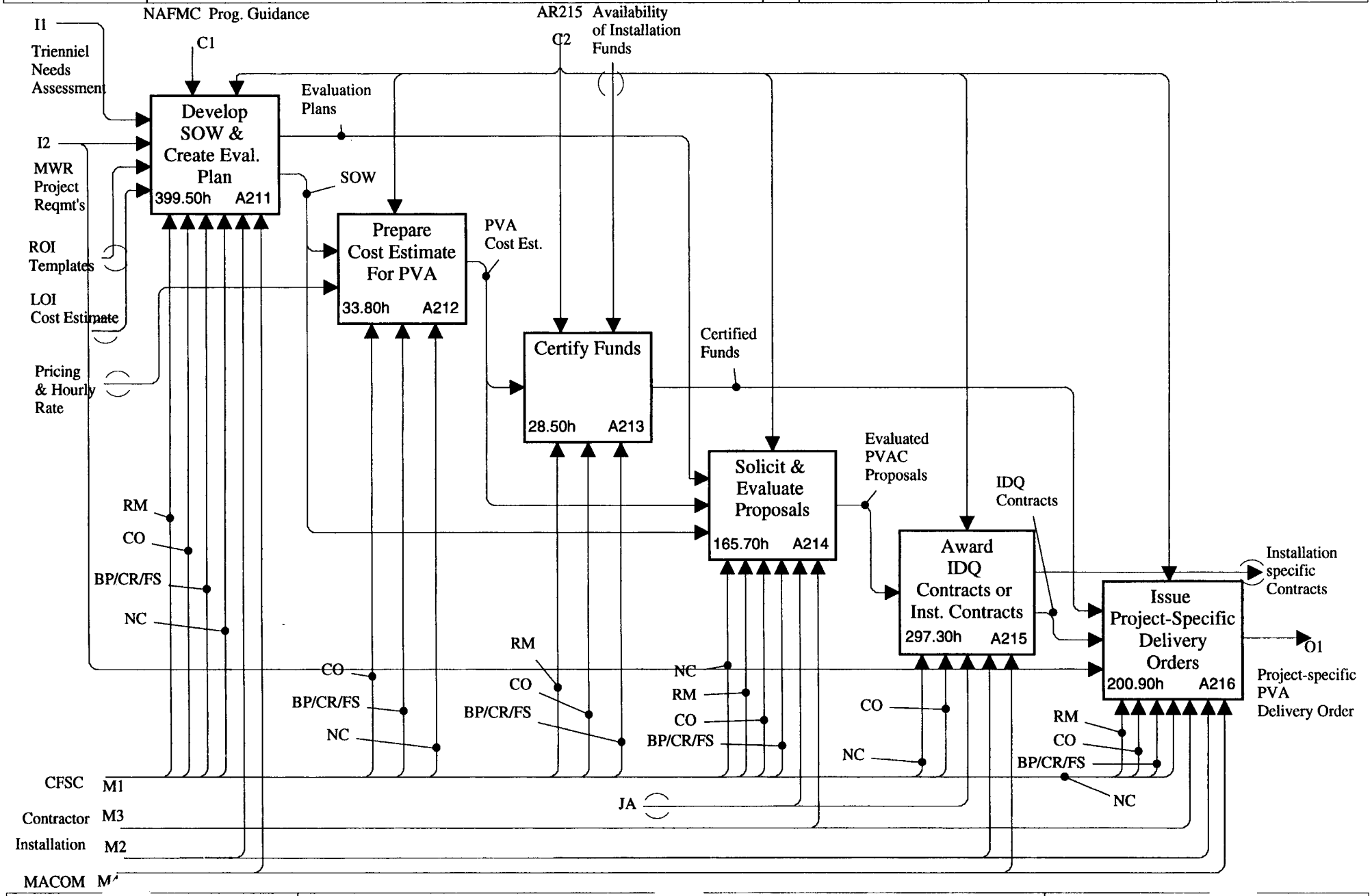
NODE: A11	TITLE: Perform Trienniel Needs Assessment	NUMBER:

USED AT:	AUTHOR: LMI	DATE: 6/05/94		WORKING	READER	DATE	CONTEXT:
	PROJECT: DELIVER NAFMC PROJECTS	REV: 2.0		DRAFT			
	NOTES: 1 2 3 4 5 6 7 8 9 10			RECOMMENDED			
				PUBLICATION			



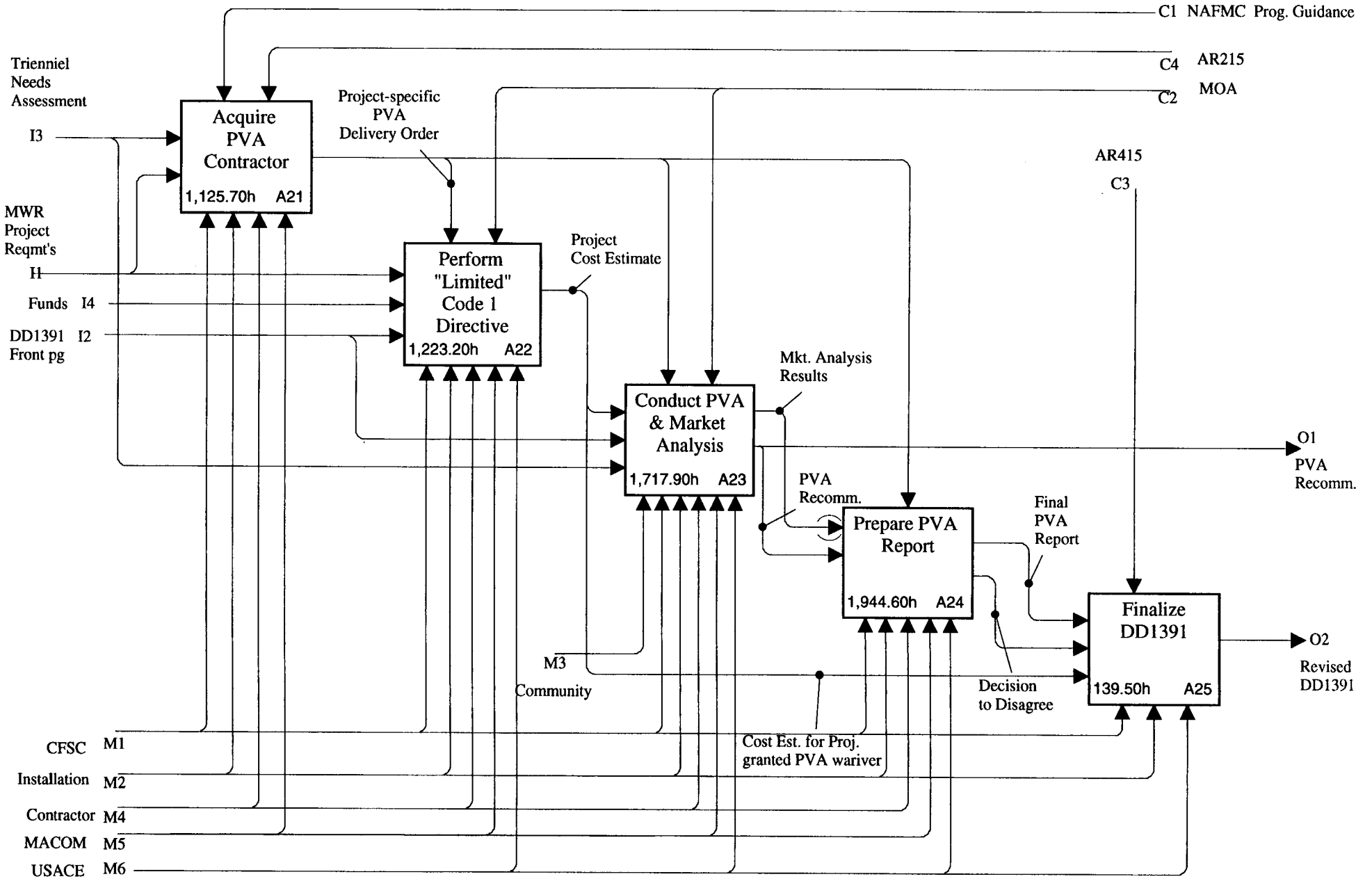
NODE: A13	TITLE: Develop DD1391 Front Page	NUMBER:

USED AT:	AUTHOR: LMI	DATE: 6/05/94		WORKING	READER	DATE	CONTEXT:
	PROJECT: DELIVER NAFMC PROJECTS	REV: 2.0		DRAFT			
	NOTES: 1 2 3 4 5 6 7 8 9 10			RECOMMENDED			
				PUBLICATION			



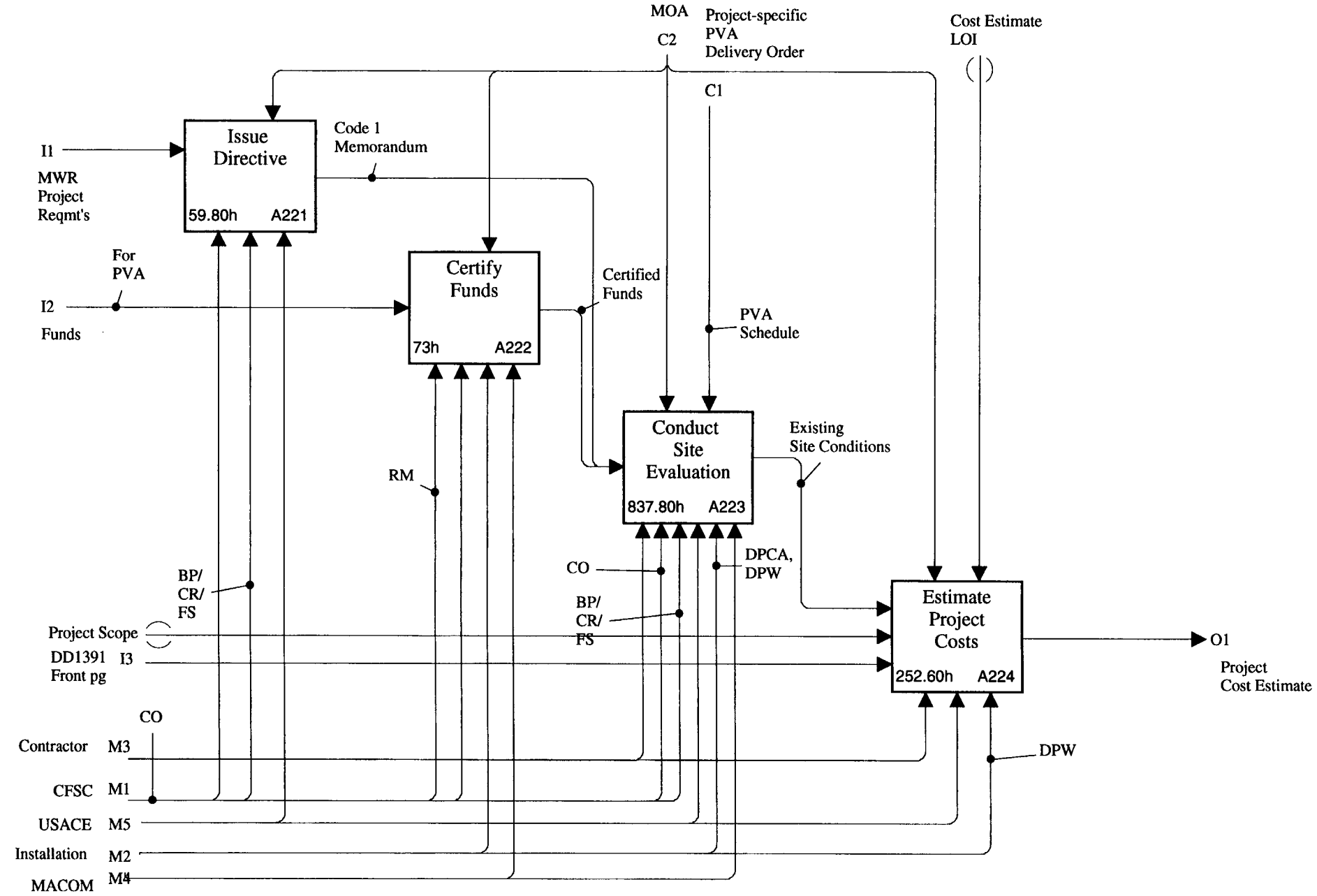
NODE: A21	TITLE: Acquire PVA Contractor	NUMBER:

USED AT:	AUTHOR: LMI	DATE:		WORKING	READER	DATE	EXT:
	PROJECT: DELIVER NAFMC PROJECTS	REV: 2.0		DRAFT			
	NOTES: 1 2 3 4 5 6 7 8 9 10			RECOMMENDED			
				PUBLICATION			



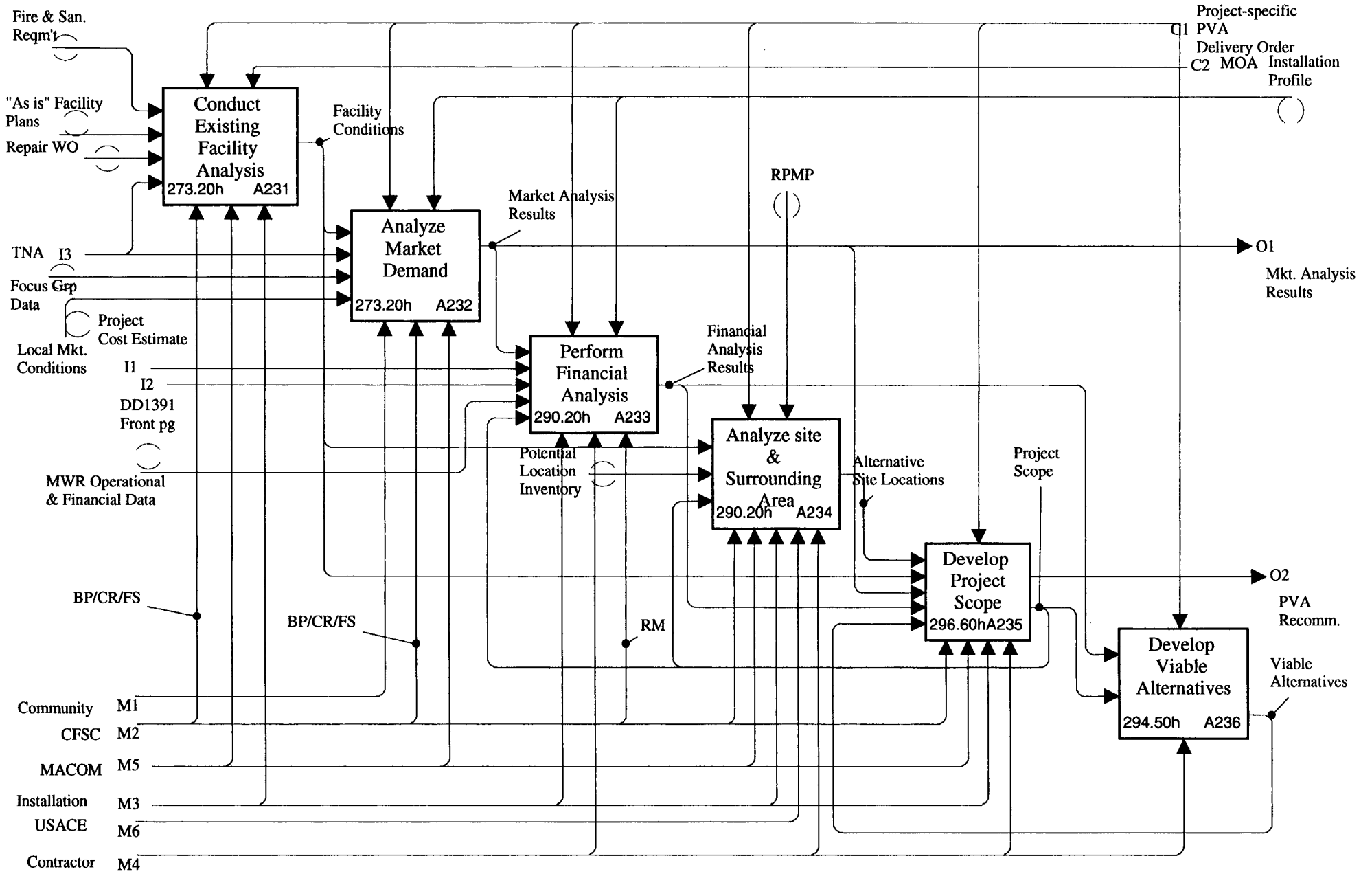
NODE: A2	TITLE: Perform Project Validation Assessment	NUMBER:

USED AT:	AUTHOR: LMI	DATE:		WORKING	READER	DATE	EXT:
	PROJECT: DELIVER NAFMC PROJECTS	REV: 2.0		DRAFT			
	NOTES: 1 2 3 4 5 6 7 8 9 10			RECOMMENDED			
				PUBLICATION			



NODE: A22	TITLE: Perform "Limited" Code 1 Directive	NUMBER:

USED AT:	AUTHOR: LMI	DATE: 6/05/94		WORKING	READER	DATE	CONTEXT:
	PROJECT: DELIVER NAFMC PROJECTS	REV: 2.0		DRAFT			
	NOTES: 1 2 3 4 5 6 7 8 9 10			RECOMMENDED			
				PUBLICATION			

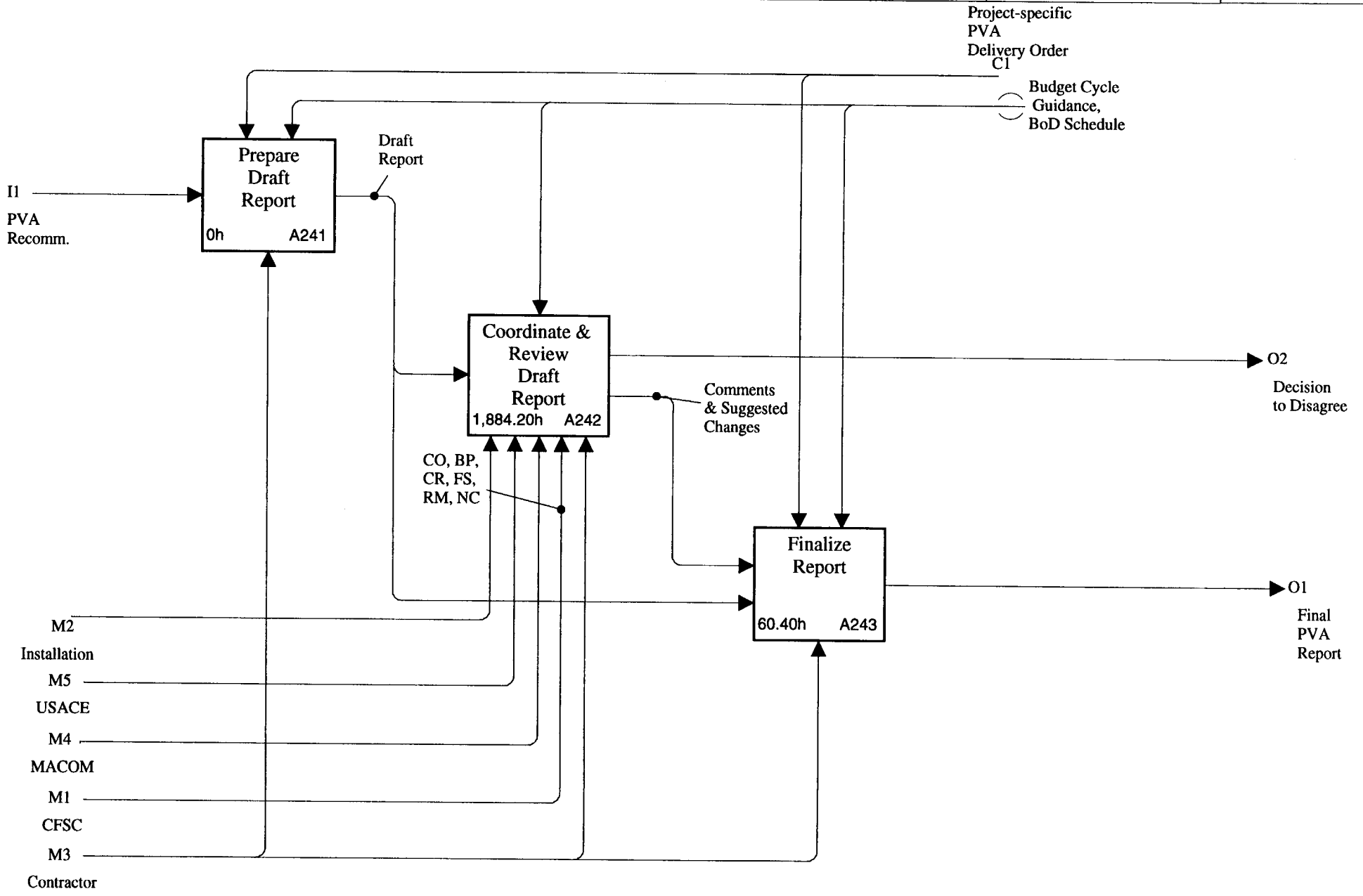


NODE: A23	TITLE: Conduct PVA & Market Analysis	NUMBER:

USED AT:	AUTHOR: LMI	DATE: 6
	PROJECT: DELIVER NAFMC PROJECTS	REV: 2.0
	NOTES: 1 2 3 4 5 6 7 8 9 10	

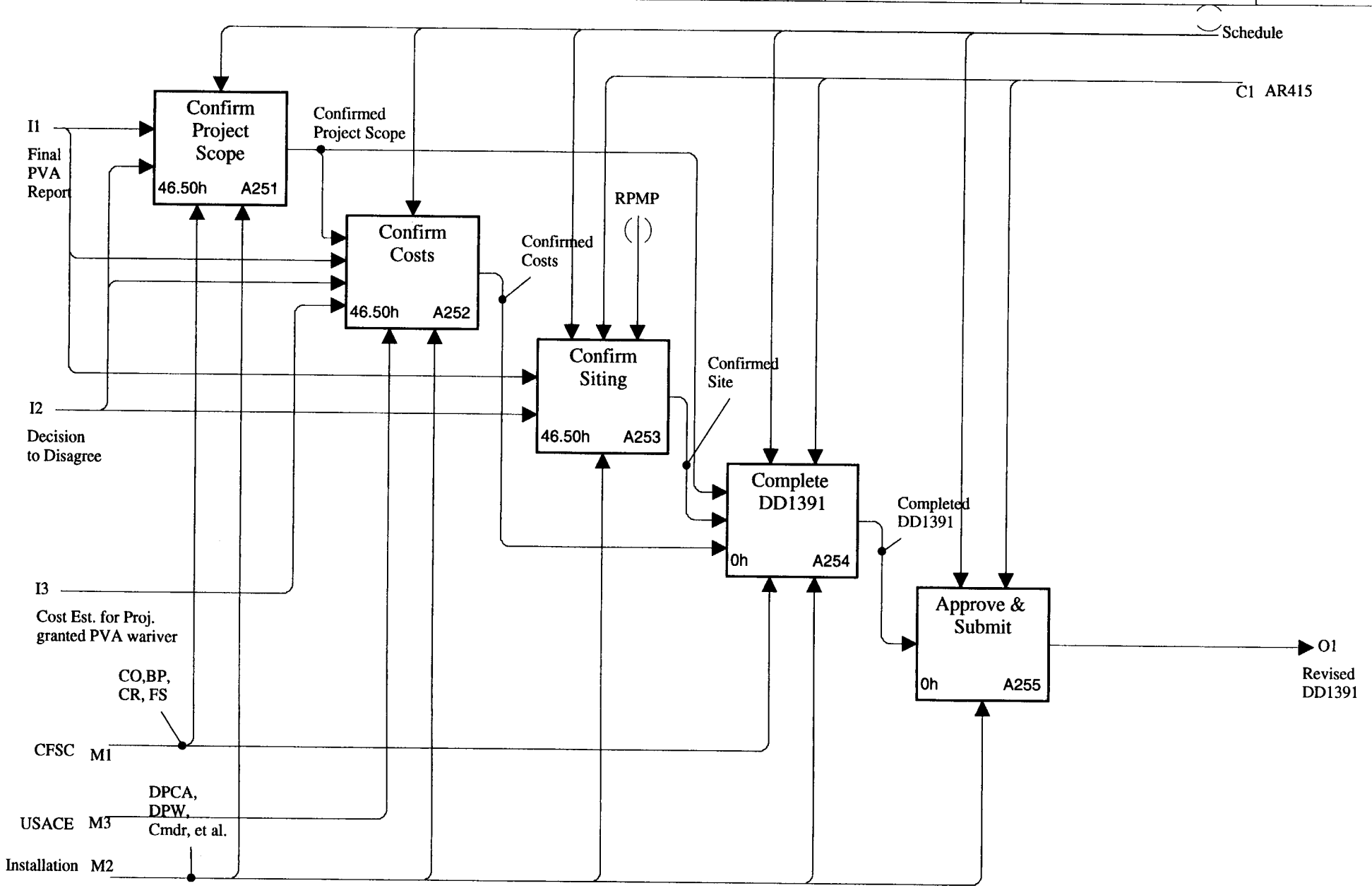
	WORKING	READER	DATE
	DRAFT		
	RECOMMENDED		
	PUBLICATION		

XT:



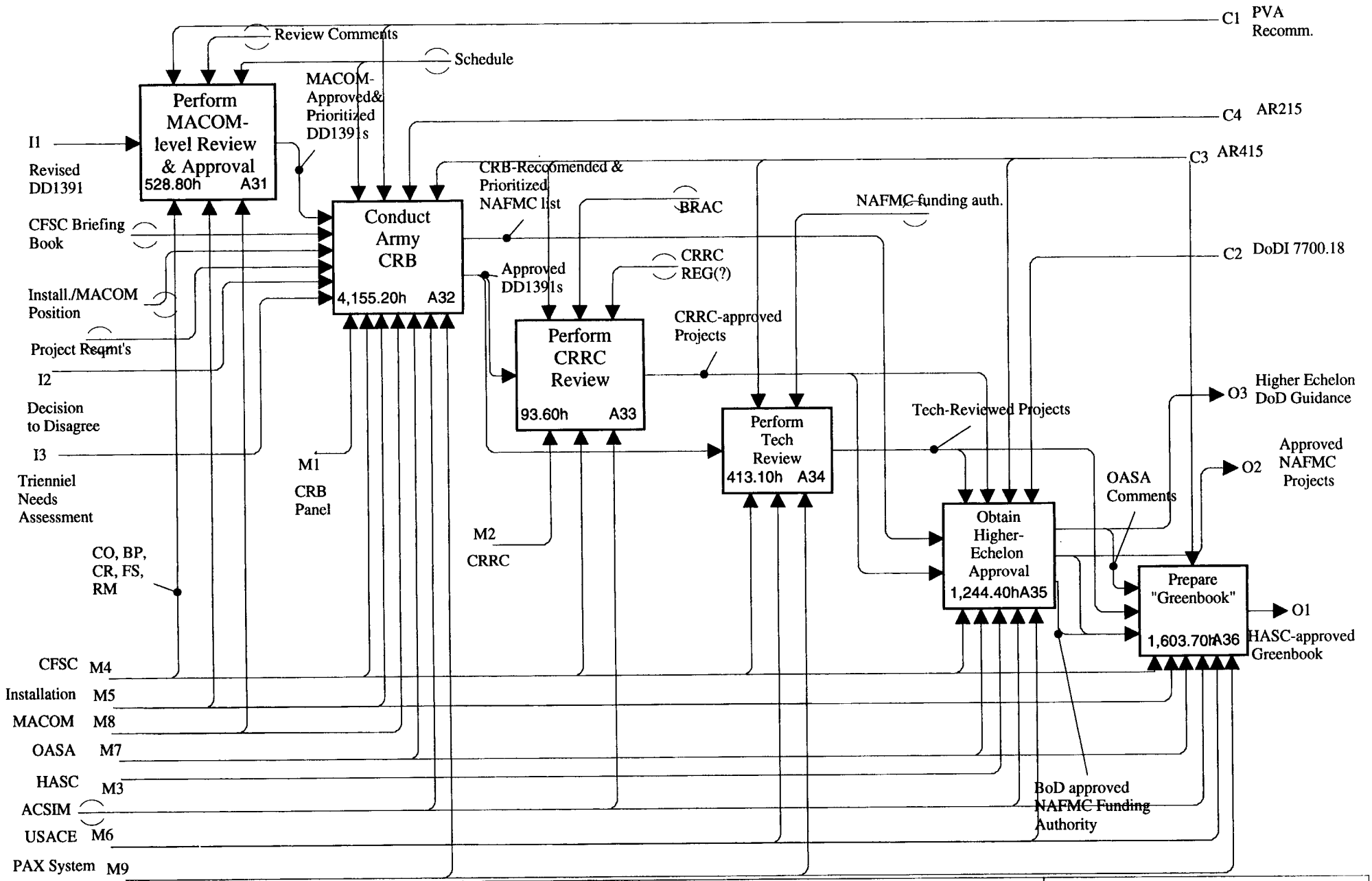
NODE: A24	TITLE: Prepare PVA Report	NUMBER:

USED AT:	AUTHOR: LMI	DATE: 6/05/94		WORKING	READER DATE	CONTEXT:
	PROJECT: DELIVER NAFMC PROJECTS	REV: 2.0		DRAFT		
	NOTES: 1 2 3 4 5 6 7 8 9 10			RECOMMENDED		
				PUBLICATION		



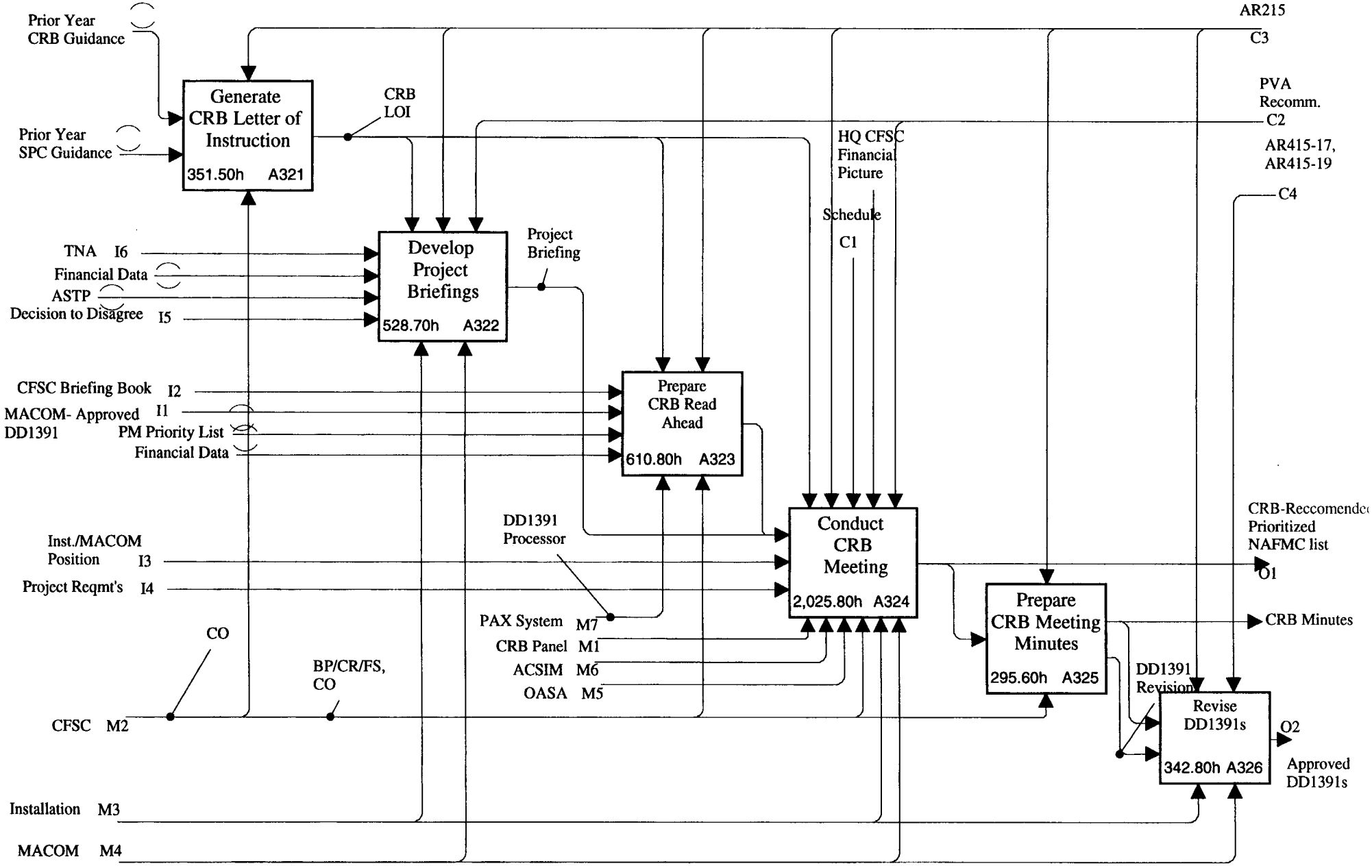
NODE: A25	TITLE: Finalize DD1391	NUMBER:

USED AT:	AUTHOR: LMI	DATE:		WORKING	READER	DATE	EXT:
	PROJECT: DELIVER NAFMC PROJECTS	REV: 2.0		DRAFT			
	NOTES: 1 2 3 4 5 6 7 8 9 10			RECOMMENDED			
				PUBLICATION			



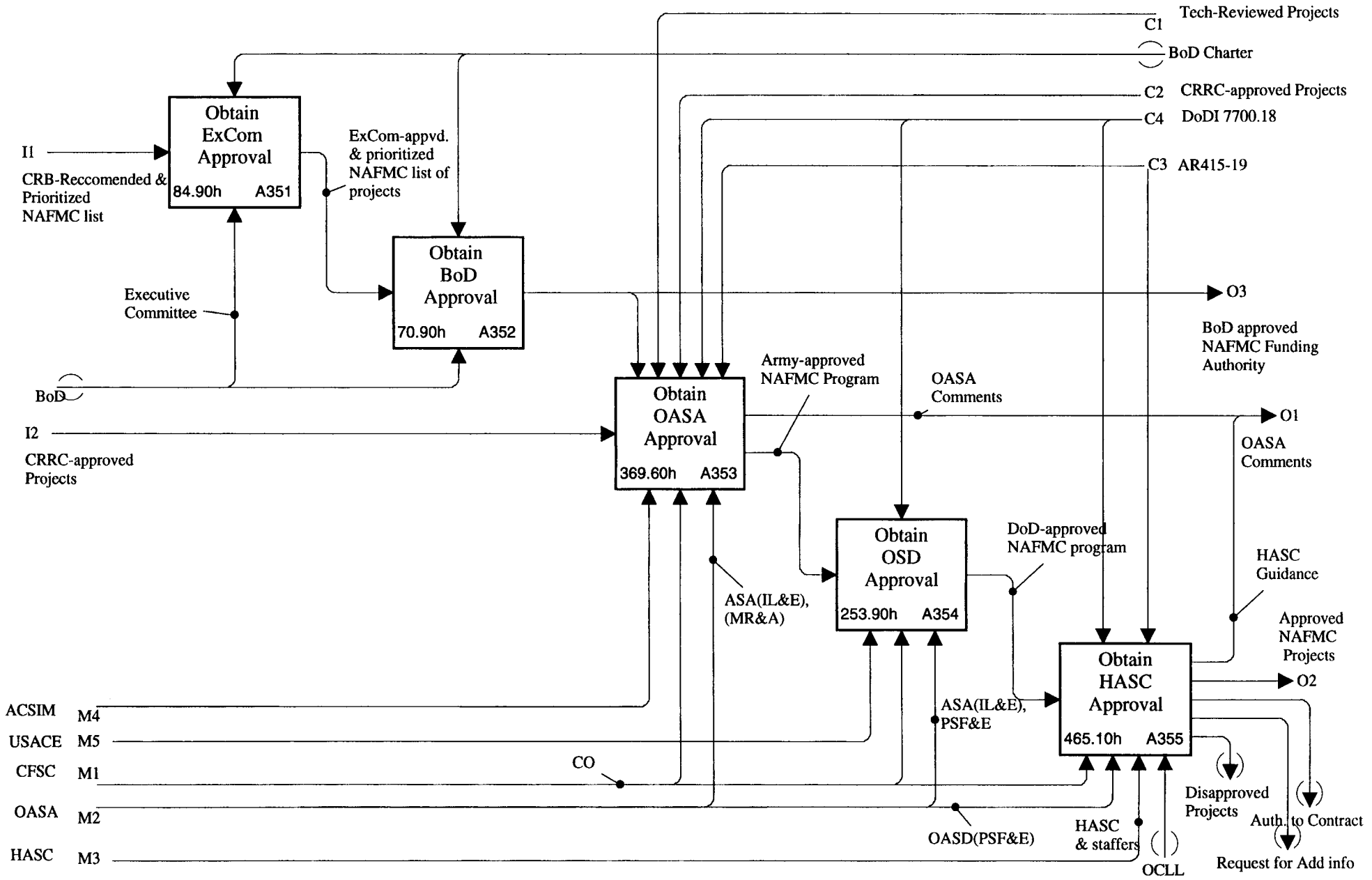
NODE: A3	TITLE: Review & Approve NAFMC Projects	NUMBER:

USED AT:	AUTHOR: LMI	DATE: 6/05/94		WORKING	READER	DATE	CONTEXT:
	PROJECT: DELIVER NAFMC PROJECTS	REV: 2.0		DRAFT			
	NOTES: 1 2 3 4 5 6 7 8 9 10			RECOMMENDED			
				PUBLICATION			



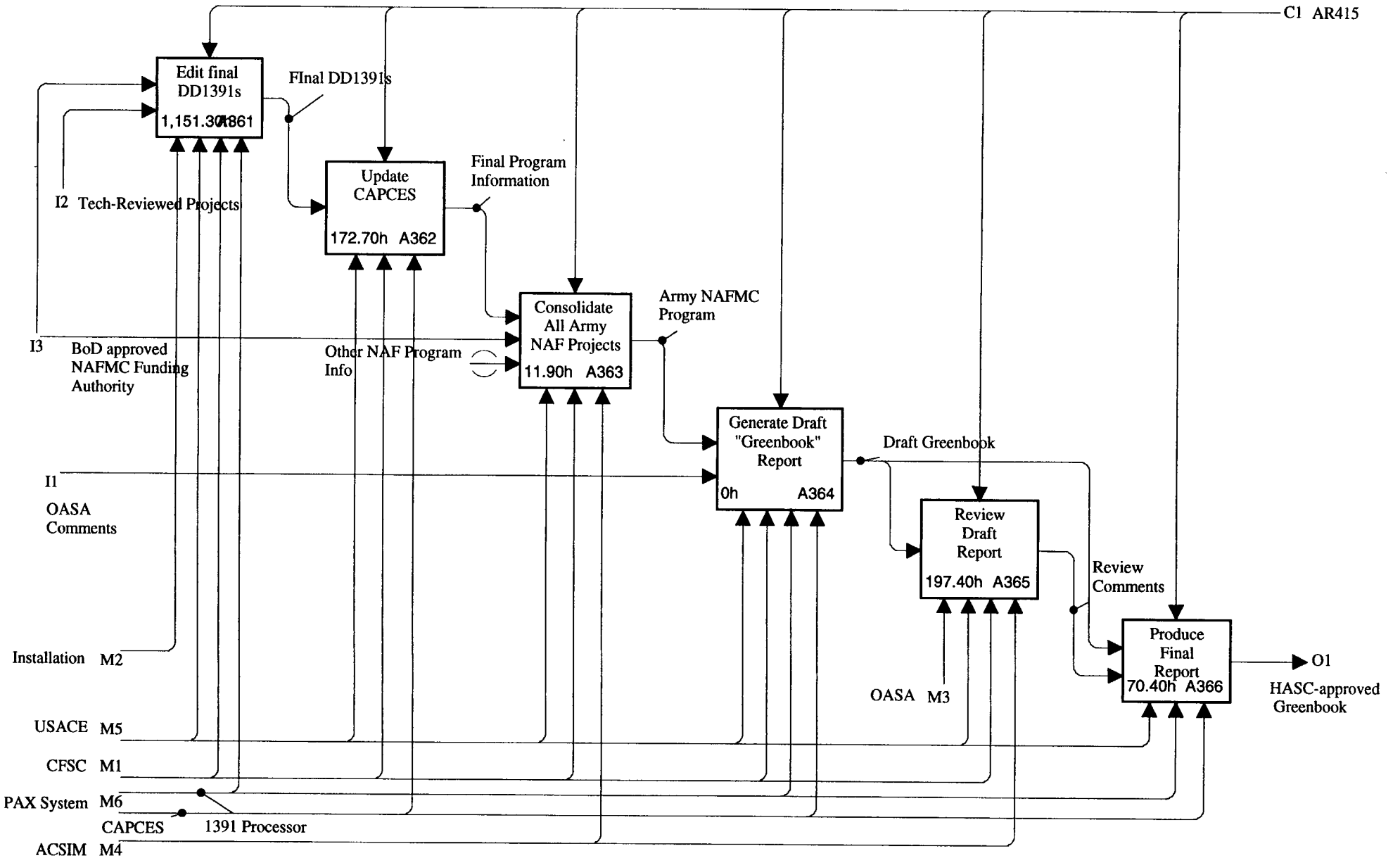
NODE: A32	TITLE: Conduct Army CRB	NUMBER:

USED AT:	AUTHOR: LMI	DATE:		WORKING	READER	DATE	EXT:
	PROJECT: DELIVER NAFMC PROJECTS	REV: 2.0		DRAFT			
	NOTES: 1 2 3 4 5 6 7 8 9 10			RECOMMENDED			
				PUBLICATION			



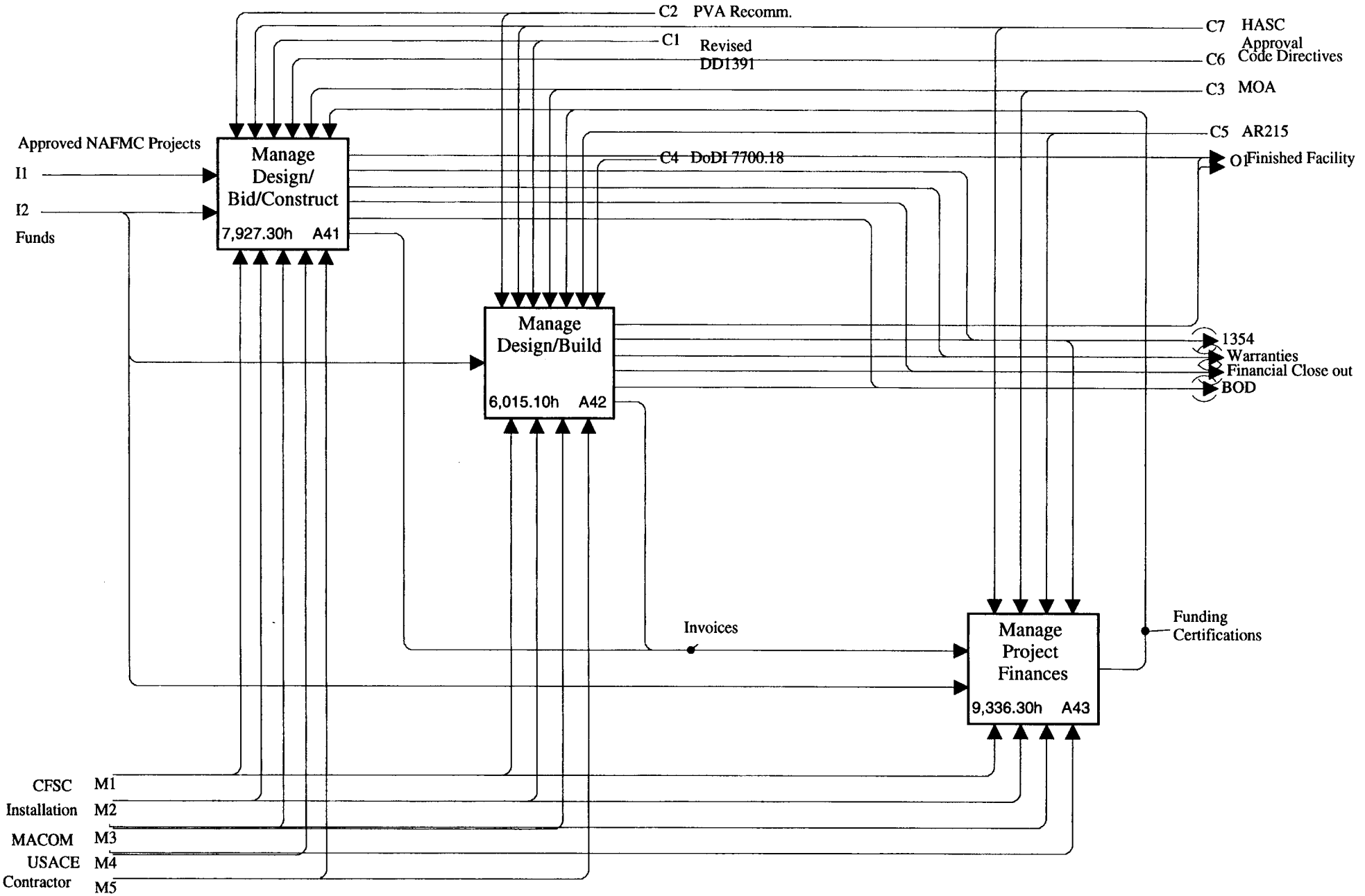
NODE: A35	TITLE: Obtain Higher- Echelon Approval	NUMBER:

USED AT:	AUTHOR: LMI	DATE: 6/05/94		WORKING	READER DATE	CONTEXT:
	PROJECT: DELIVER NAFMC PROJECTS	REV: 2.0		DRAFT		
	NOTES: 1 2 3 4 5 6 7 8 9 10			RECOMMENDED		
				PUBLICATION		



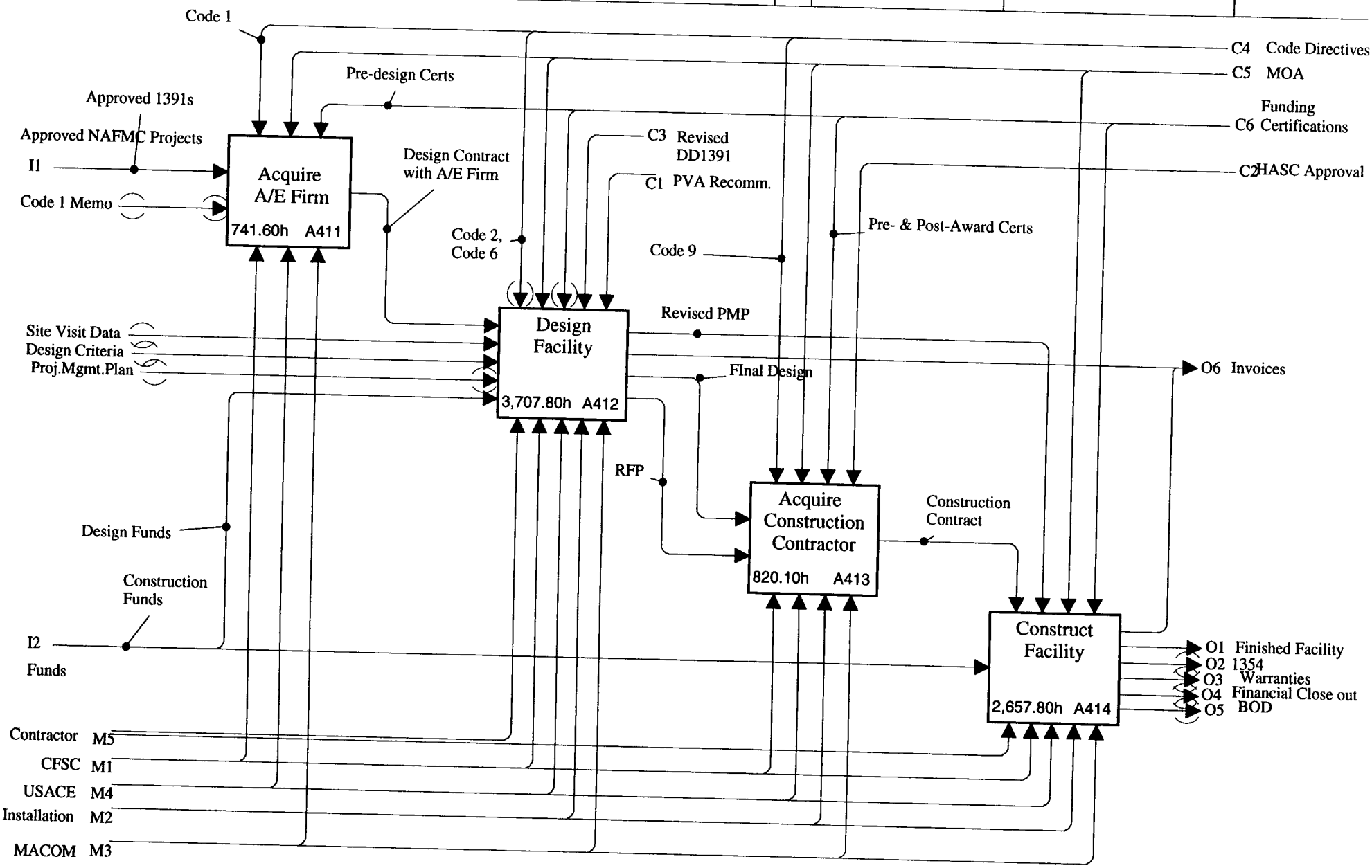
NODE: A36	TITLE: Prepare "Greenbook"	NUMBER:

USED AT:	AUTHOR: LMI	DATE:		WORKING	READER	DATE	EXT:
	PROJECT: DELIVER NAFMC PROJECTS	REV: 2.0		DRAFT			
	NOTES: 1 2 3 4 5 6 7 8 9 10			RECOMMENDED			
				PUBLICATION			



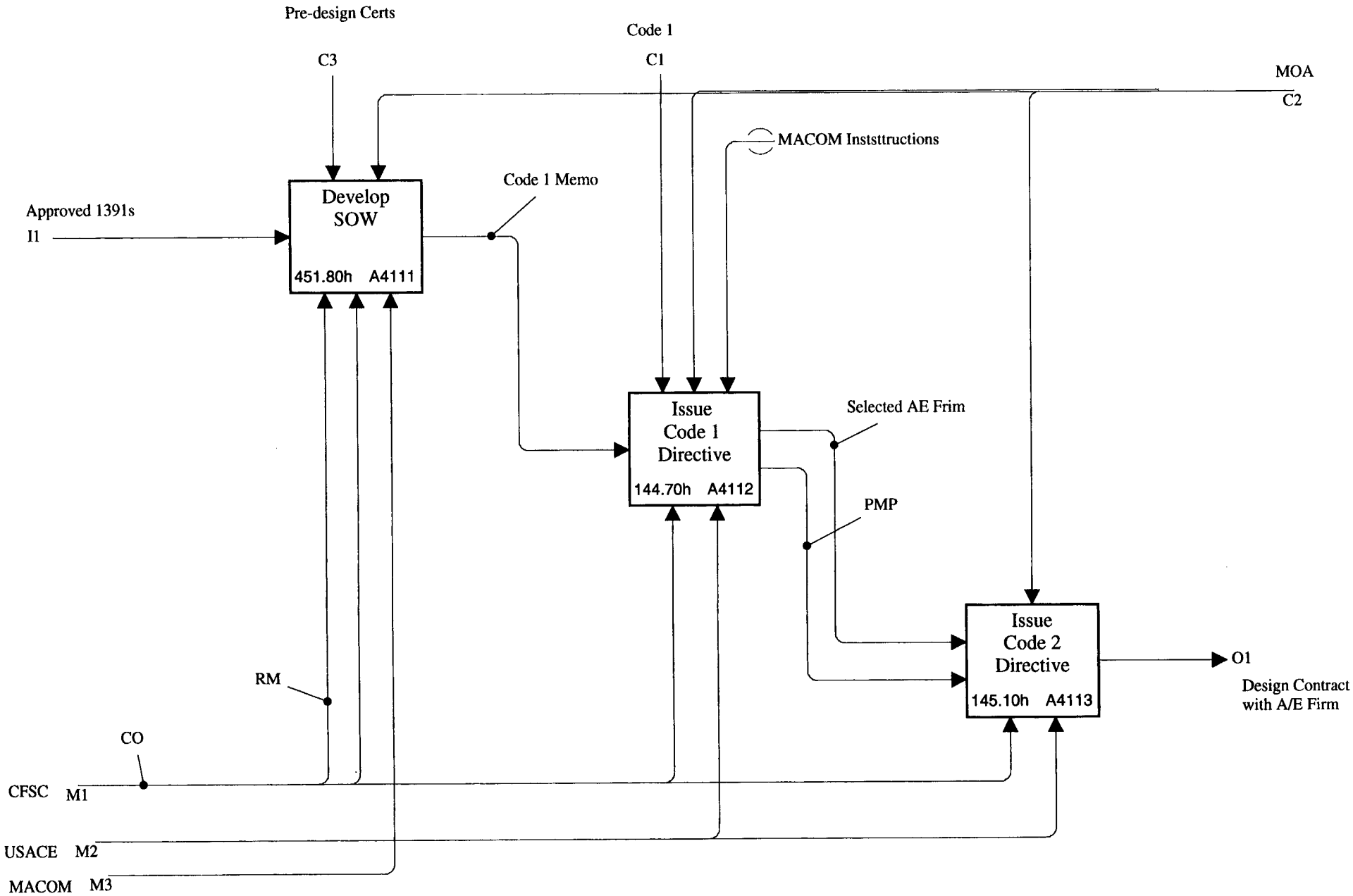
NODE: A4	TITLE: Manage Project Execution	NUMBER:

USED AT:	AUTHOR: LMI	DATE: 6/05/94		WORKING	READER	DATE	CONTEXT:
	PROJECT: DELIVER NAFMC PROJECTS	REV: 2.0		DRAFT			
	NOTES: 1 2 3 4 5 6 7 8 9 10			RECOMMENDED			
				PUBLICATION			



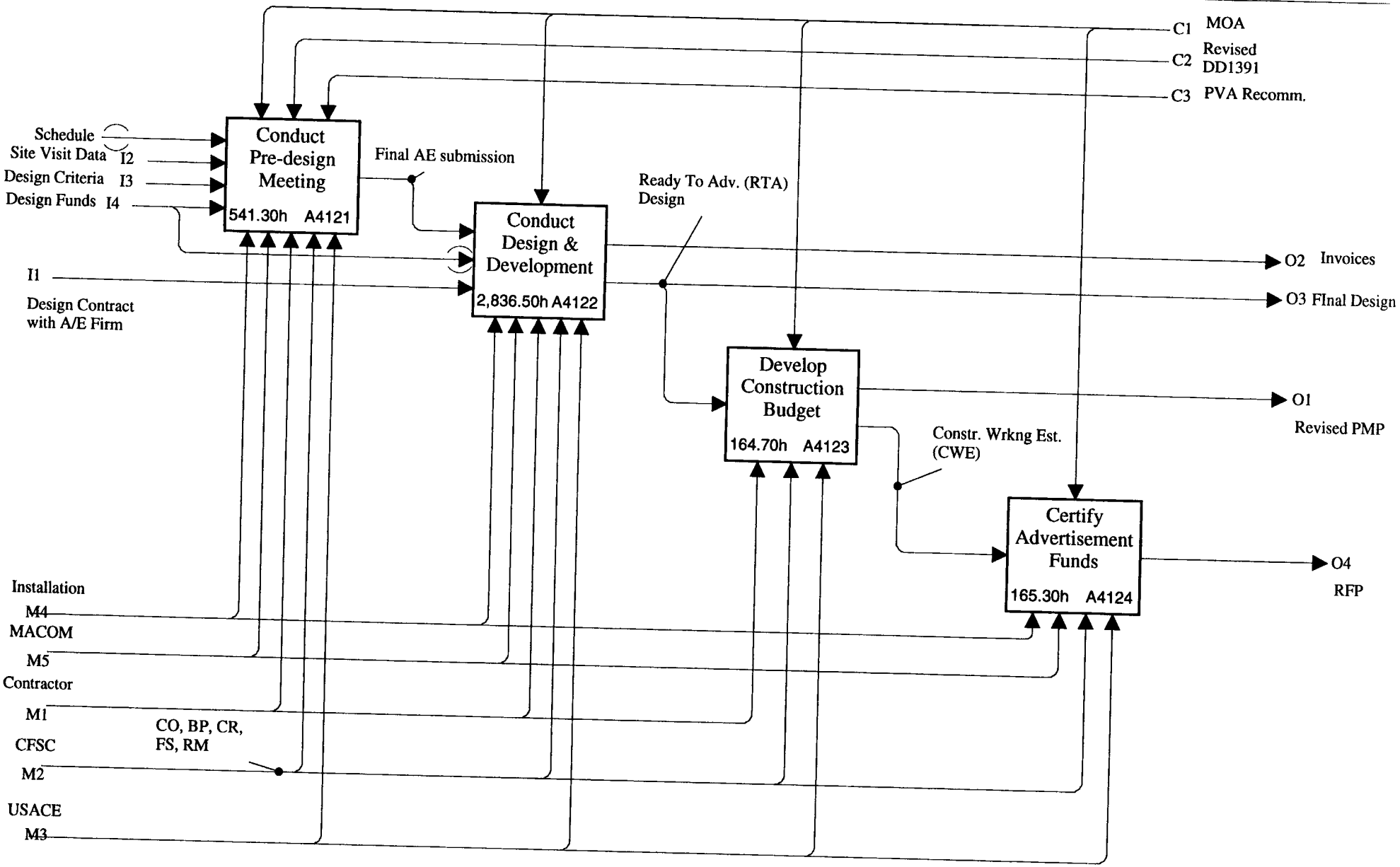
NODE: A41	TITLE: Manage Design/ Bid/Construct	NUMBER:

USED AT:	AUTHOR: LMI	DATE:		WORKING	READER	DATE	EXT:
	PROJECT: DELIVER NAFMC PROJECTS	REV: 2.0		DRAFT			
	NOTES: 1 2 3 4 5 6 7 8 9 10			RECOMMENDED			
				PUBLICATION			



NODE: A411	TITLE: Acquire A/E Firm	NUMBER:

USED AT:	AUTHOR: LMI	DATE: 6/05/94		WORKING	READER DATE	CONTEXT:
	PROJECT: DELIVER NAFMC PROJECTS	REV: 2.0		DRAFT		
	NOTES: 1 2 3 4 5 6 7 8 9 10			RECOMMENDED		
				PUBLICATION		

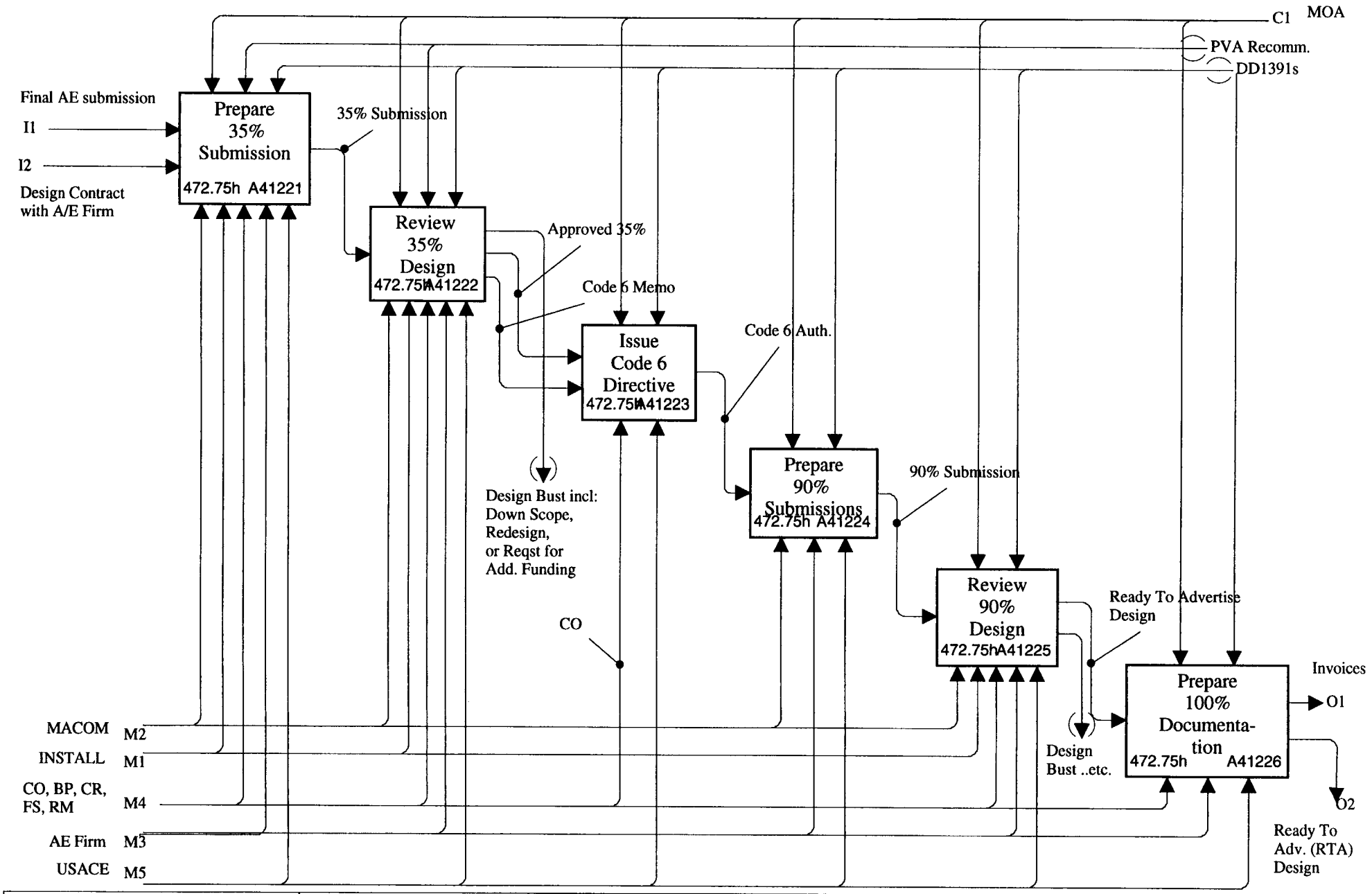


NODE: A412	TITLE: Design Facility	NUMBER:

USED AT:	AUTHOR: LMI	DATE: 6
	PROJECT: DELIVER NAFMC PROJECTS	REV: 2.0
	NOTES: 1 2 3 4 5 6 7 8 9 10	

	WORKING	READER	DATE
	DRAFT		
	RECOMMENDED		
	PUBLICATION		

XT:

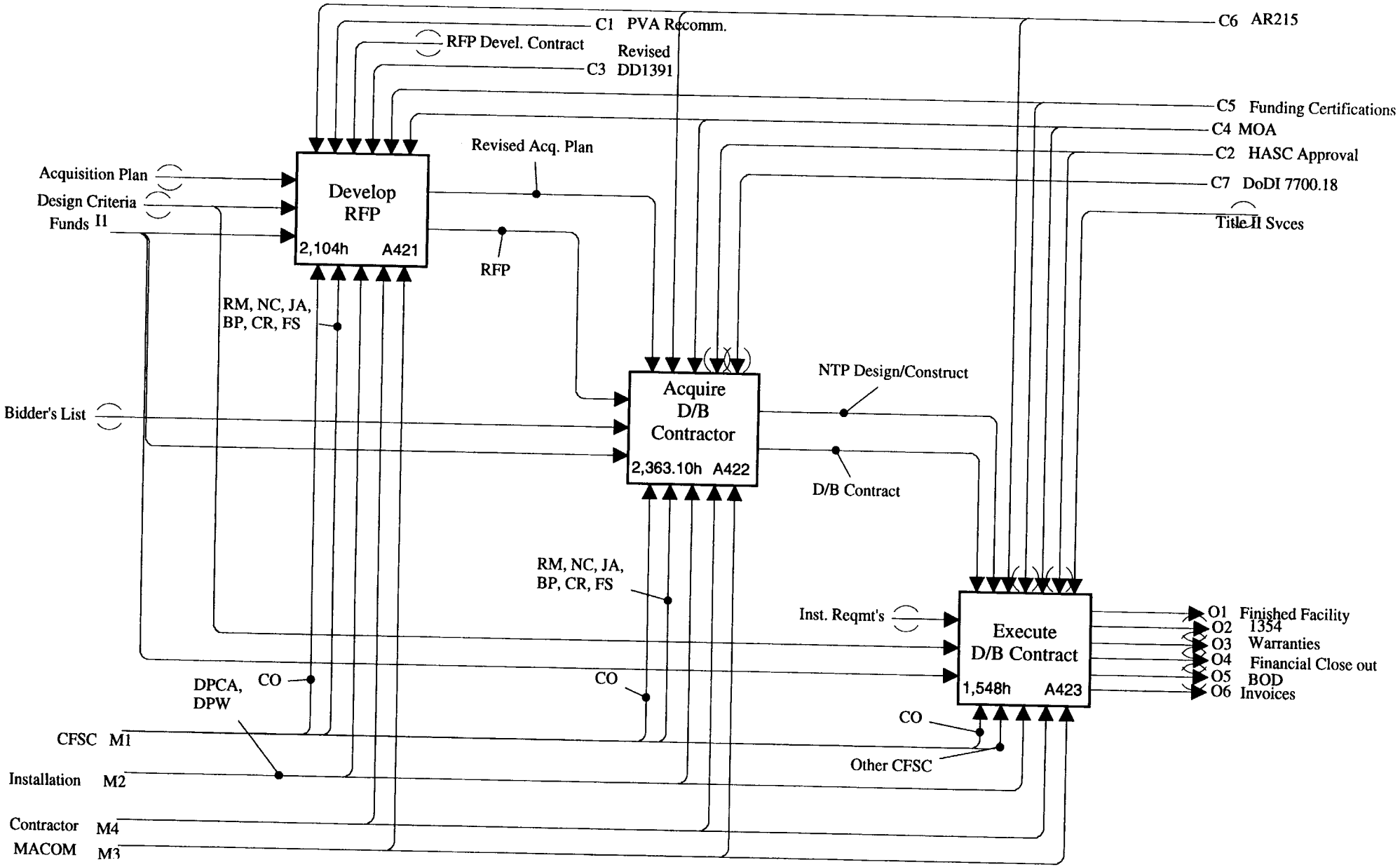


NODE: A4122	TITLE: Conduct Design & Development	NUMBER:

USED AT:	AUTHOR: LMI	DATE: 6/05/94
	PROJECT: DELIVER NAFMC PROJECTS	REV: 2.0
	NOTES: 1 2 3 4 5 6 7 8 9 10	

	WORKING	READER	DATE
	DRAFT		
	RECOMMENDED		
	PUBLICATION		

CONTEXT:

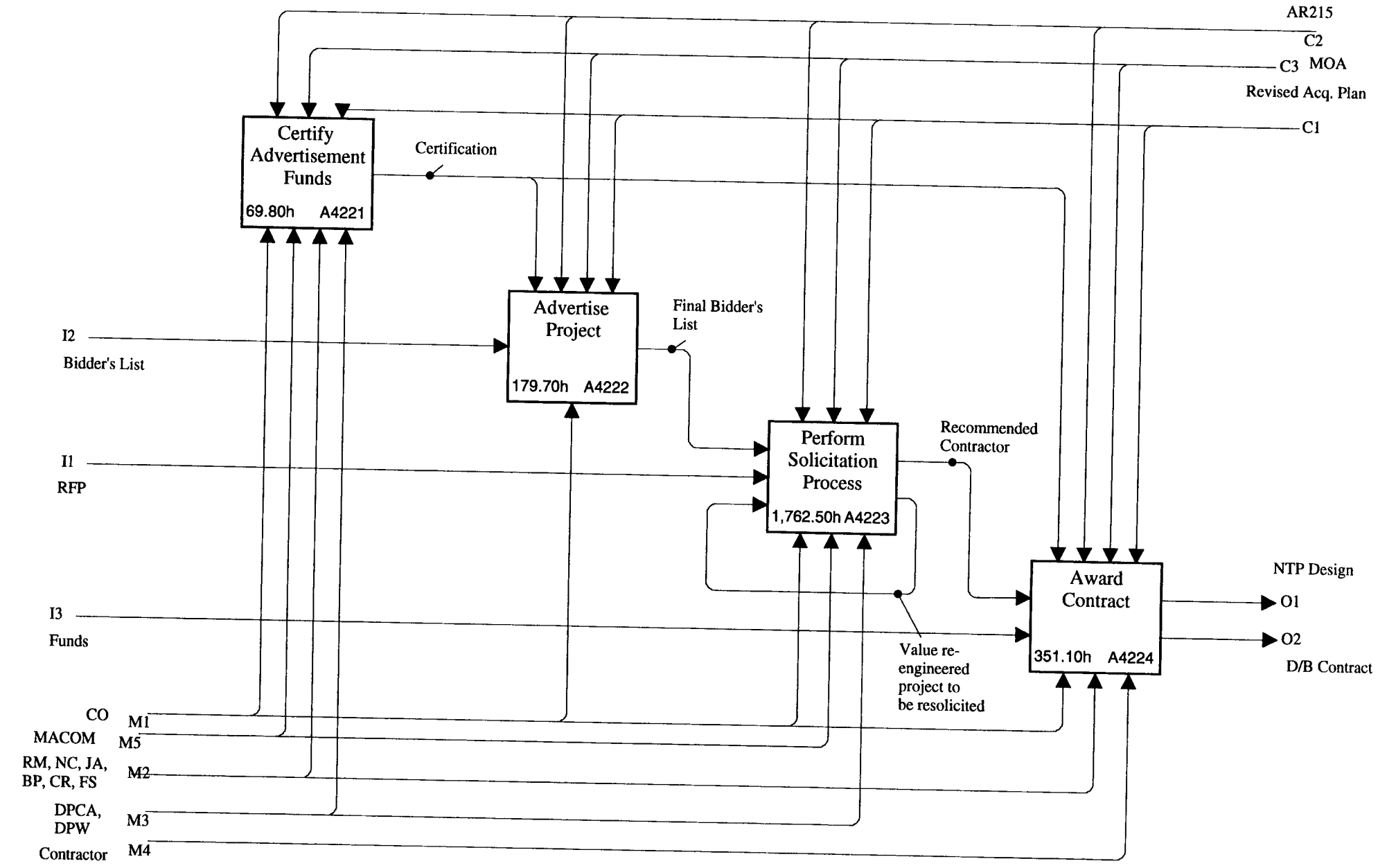


NODE: A42	TITLE: Manage Design/Build	NUMBER:

USED AT:	AUTHOR: LMI	DATE: 6
	PROJECT: DELIVER NAFMC PROJECTS	REV: 2.0
	NOTES: 1 2 3 4 5 6 7 8 9 10	

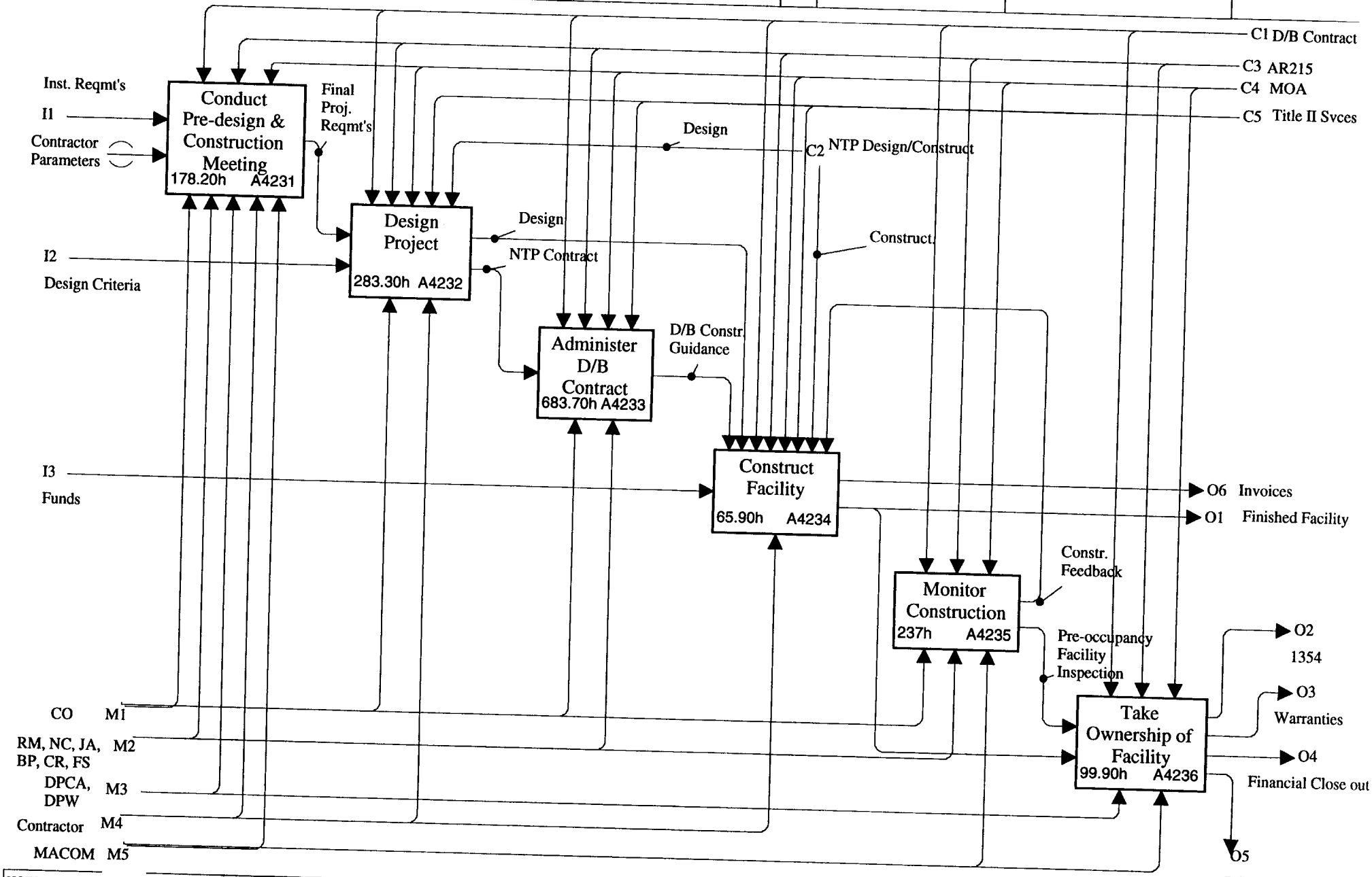
	WORKING	READER	DATE
	DRAFT		
	RECOMMENDED		
	PUBLICATION		

XT:



NODE: A422	TITLE: Acquire D/B Contractor	NUMBER:

USED AT:	AUTHOR: LMI	DATE: 6/05/94		WORKING	READER	DATE	CONTEXT:
	PROJECT: DELIVER NAFMC PROJECTS	REV: 2.0		DRAFT			
	NOTES: 1 2 3 4 5 6 7 8 9 10			RECOMMENDED			
				PUBLICATION			

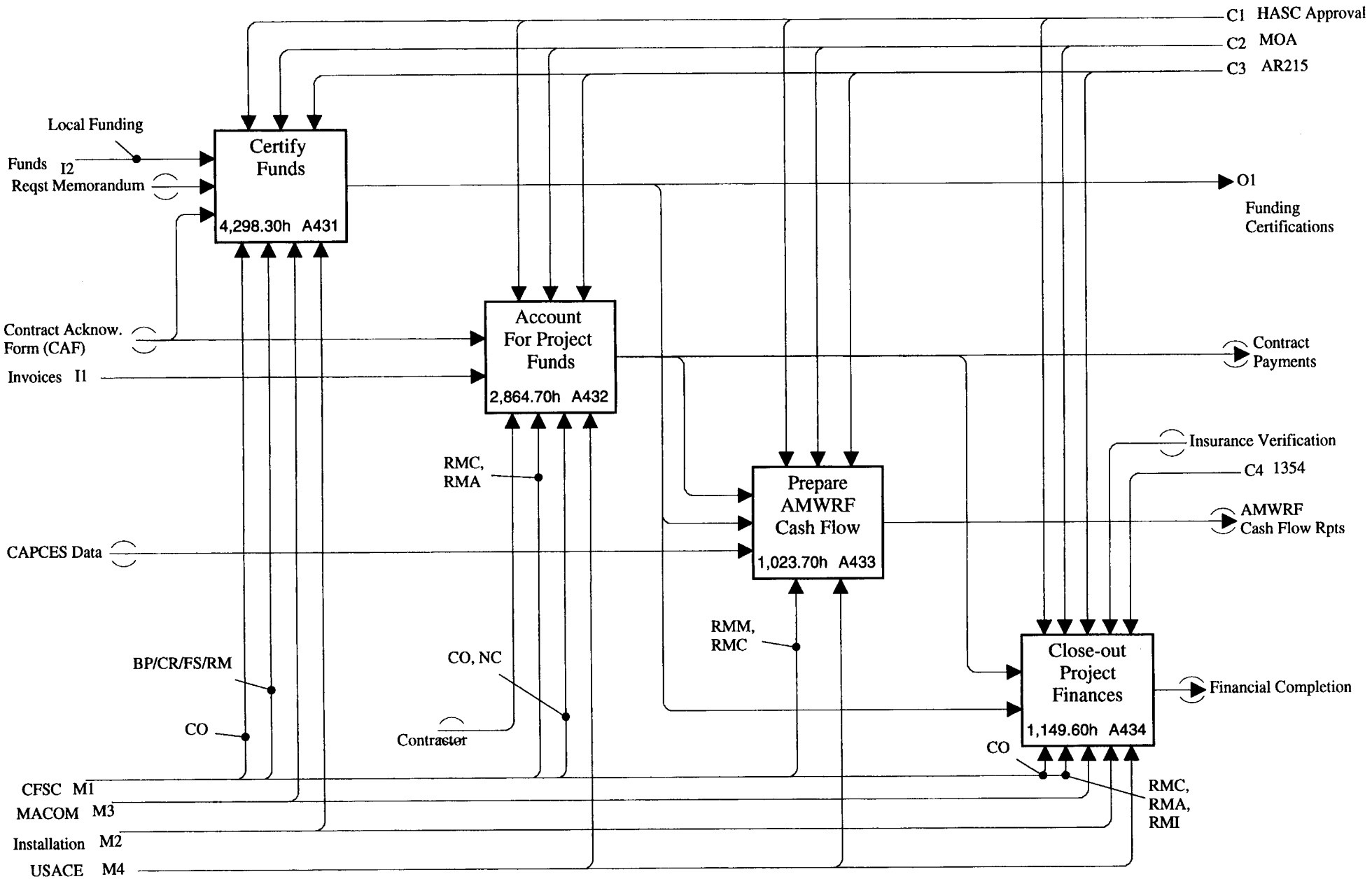


NODE: A423	TITLE: Execute D/B Contract	NUMBER:

USED AT:	AUTHOR: LMI	DATE: 6
	PROJECT: DELIVER NAFMC PROJECTS	REV: 2.0
	NOTES: 1 2 3 4 5 6 7 8 9 10	

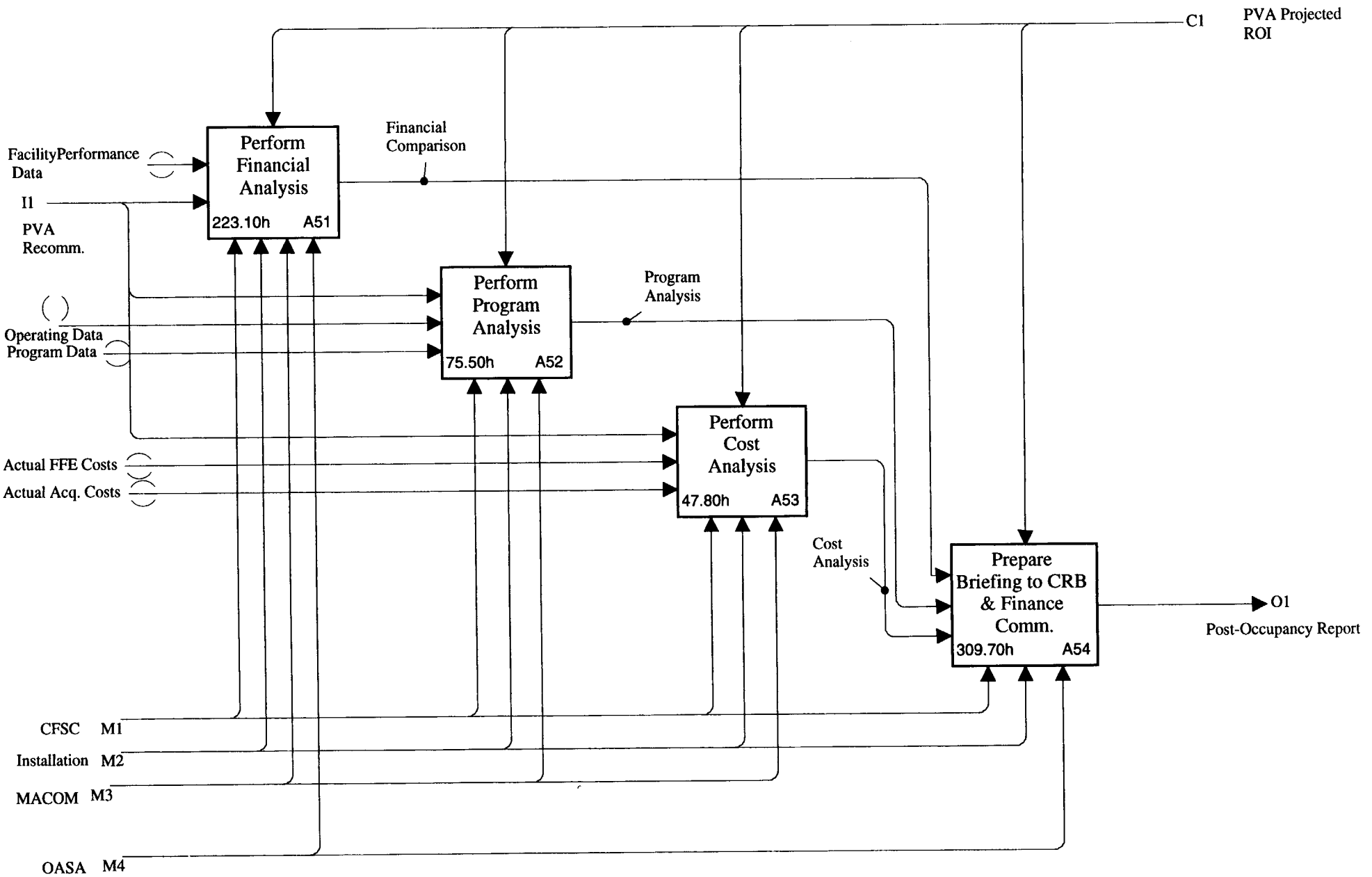
	WORKING	READER	DATE
X	DRAFT		
	RECOMMENDED		
	PUBLICATION		

XT:



NODE: A43	TITLE: Manage Project Finances	NUMBER:

USED AT:	AUTHOR: LMI	DATE: 6/05/94		WORKING	READER	DATE	CONTEXT:
	PROJECT: DELIVER NAFMC PROJECTS	REV: 2.0		DRAFT			
	NOTES: 1 2 3 4 5 6 7 8 9 10			RECOMMENDED			
				PUBLICATION			



NODE: A5	TITLE: Perform Post- Occupancy Asse c	NUMBER:

APPENDIX C

Activity-Based Costing Worksheet

NAFMC ACTIVITY-BASED COSTING WORKSHEET

				CS	CO	COE	COP	COD	BP	BPA	NC	NCC	NCP	CR	FS	RM	RMA	RMC	RMI	RMM	JA	IR	FORSCOM	%	TOTALS
			FTE Staffing	1	1	8	4	6	1	4	1	2.3	1	2	1	1	6	8	1	2	2	1	3		
			Total Available Hours	1760	1760	14080	7040	10560	1760	7040	1760	4065.6	1760	3520	1760	1760	10560	14080	1760	3520	3520	1760	5280		99,105.6
			% Time on NAFMC	0.05	0.7207	0.922	0.85	0.1	0.12	0.24	0.03	0.85	0.03	0.3948	0.1	0.15	0.25	0.4	0.02	0.2	0.05	0.05	0.8376		
			Total Allocatable Hours	88	1268.4	12981.8	5984	1056	211.2	1689.6	52.8	3455.8	52.8	1389.7	169	264	2640	5632	35.2	704	176	88	4422.53	100.0%	42,361.7
A1			Identify Project Requirements	0	38.053	129.818	2094.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1985.72	10.0%	4,248.0
	A11		Perform Triennial Needs Assess	0	0	129.818	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1443.61	3.7%	1,573.4
		A111	Identify Consumer Needs	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	288.723	0.7%	288.7
		A112	Perform Local Market Analysis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	288.723	0.7%	288.7
		A113	Assess Existing Facility Avail.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	288.723	0.7%	288.7
		A114	Perform Resource Analysis	0	0	129.818	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	288.723	1.0%	418.5
		A115	Evaluate Alternatives	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	288.723	0.7%	288.7
	A12		Develop 5-Year Plan	0	12.557	0	41.888	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	180.7	0.6%	235.1
	A13		Develop DD1391 Front Page	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	359.414	0.8%	359.4
		A131	Develop Preliminary Scope	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%	0.0
		A132	Develop Preliminary Cost Estimate	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%	0.0
		A133	Acquire Facility Site	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%	0.0
		A134	Develop Narrative Justification	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	179.707	0.4%	179.7
		A135	Prepare Automated 1391 Form	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	179.707	0.4%	179.7
	A14		Develop & Issue Program Guid.	0	25.495	0	1026.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.5%	1,051.8
	A15		Update CAPSES Database	0	0	0	1026.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.4%	1,026.3
A2			Perform Proj. Valid. Assesmt	0	63.422	1298.18	0	0	48.576	1233.4	19	863.94	19	1078.4	123	0	0	563.2	0	0	35.2	0	614.731	14.1%	5,960.4
	A21		Aquire PVA Contractor	0	25.369	64.9088	0	0	8.2579	61.67	19	803.46	19	59.744	6.17	0	0	0	0	0	35.2	0	12.2946	2.6%	1,115.1
		A211	Develop SOW & Create Eval. Pln.	0	12.684	64.9088	0	0	8.2579	30.835	16.7	200.87	16.7	37.22	3.08	0	0	0	0	0	0	0	0	0.9%	391.3
		A212	Prepare PVA Cost Estimate	0	0	0	0	0	0	8.0172	2.28	8.0346	2.28	11.769	0.8	0	0	0	0	0	0	0	0	0.1%	33.2
		A213	Certify Funds	0	12.684	0	0	0	0	0	0	0	0	2.9274	0	0	0	0	0	0	0	0	12.2946	0.1%	27.9
		A214	Solicit & Evaluate Proposals	0	0	0	0	0	0	22.818	0	96.416	0	7.8264	2.28	0	0	0	0	0	35.2	0	0	0.4%	164.5
		A215	Award IDQ Contracts	0	0	0	0	0	0	0	0	297.28	0	0	0	0	0	0	0	0	0	0	0	0.7%	297.3
		A216	Issue Proj. Specific Del. Orders	0	0	0	0	0	0	0	0	200.87	0	0	0	0	0	0	0	0	0	0	0	0.5%	200.9
	A22		Perform "Limited" Code 1 Direct.	0	25.369	1103.45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.7%	1,128.8
		A221	Issue Code 1 Directive	0	0	55.1725	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1%	55.2
		A222	Certify Funds	0	12.684	55.1725	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2%	67.9
		A223	Conduct Site Evaluation	0	0	772.415	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.8%	772.4
		A224	Estimate Project Costs	0	12.684	220.69	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.6%	233.4
	A23		Conduct PVA & Market Analysis	0	0	0	0	0	10.687	740.04	0	0	0	842.23	74	0	0	0	0	0	0	0	0	3.9%	1,667.0
		A231	Conduct Existing Facil. Analysis	0	0	0	0	0	0	118.41	0	0	0	134.76	11.8	0	0	0	0	0	0	0	0	0.6%	265.0
		A232	Analyze Market Demand	0	0	0	0	0	0	118.41	0	0	0	134.76	11.8	0	0	0	0	0	0	0	0	0.6%	265.0
		A233	Perform Financial Analysis	0	0	0	0	0	0	125.81	0	0	0	143.18	12.6	0	0	0	0	0	0	0	0	0.7%	281.6
		A234	Analyze Site & Surrounding Area	0	0	0	0	0	0	125.81	0	0	0	143.18	12.6	0	0	0	0	0	0	0	0	0.7%	281.6
		A235	Develop Project Scope	0	0	0	0	0	6.412	125.81	0	0	0	143.18	12.6	0	0	0	0	0	0	0	0	0.7%	288.0
		A236	Develop Viable Alternatives	0	0	0	0	0	4.2747	125.81	0	0	0	143.18	12.6	0	0	0	0	0	0	0	0	0.7%	285.8

NAFMC ACTIVITY-BASED COSTING WORKSHEET

				CS	CO	COE	COP	COD	BP	BPA	NC	NCC	NCP	CR	FS	RM	RMA	RMC	RMI	RMM	JA	IR	FORSCOM	%	TOTALS
			FTE Staffing	1	1	8	4	6	1	4	1	2.3	1	2	1	1	6	8	1	2	2	1	3		
			Total Available Hours	1760	1760	14080	7040	10560	1760	7040	1760	4065.6	1760	3520	1760	1760	10560	14080	1760	3520	3520	1760	5280		99,105.6
			% Time on NAFMC	0.05	0.7207	0.922	0.85	0.1	0.12	0.24	0.03	0.85	0.03	0.3948	0.1	0.15	0.25	0.4	0.02	0.2	0.05	0.05	0.8376		
			Total Allocatable Hours	88	1268.4	12981.8	5984	1056	211.2	1689.6	52.8	3455.8	52.8	1389.7	169	264	2640	5632	35.2	704	176	88	4422.53	100.0%	42,361.7
	A24		Prepare PVA Report	0	12.684	0	0	0	29.631	431.69	0	60.476	0	175.78	43.2	0	0	563.2	0	0	0	0	602.437	4.5%	1,919.1
		A241	Prepare Draft Report	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%	0.0
		A242	Coordinate & Review Draft	0	12.684	0	0	0	29.631	431.69	0	60.476	0	175.78	43.2	0	0	563.2	0	0	0	0	542.193	4.4%	1,858.8
		A243	Finalize Report	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	60.2437	0.1%	60.2
	A25		Finalize DD1391	0	0	129.818	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3%	129.8
		A251	Confirm Project Scope	0	0	42.8398	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1%	42.8
		A252	Confirm Costs	0	0	42.8398	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1%	42.8
		A253	Confirm Siting	0	0	42.8398	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1%	42.8
		A254	Complete DD1391 Form	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%	0.0
		A255	Approve & Submit DD1391	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%	0.0
A3			Review & Approve NAFMC Proj	88	761.06	1298.18	3889.6	0	154.16	118.27	0	0	0	172.32	11.8	26.4	0	281.6	0	0	0	0	1052.56	18.5%	7,854.0
	A31		Perform MACOM-Level R&A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	527.333	1.2%	527.3
	A32		Conduct Army CRB	66	213.1	649.088	2022.6	0	77.088	59.136	0	0	0	172.32	5.91	26.4	0	281.6	0	0	0	0	518.913	9.7%	4,092.1
		A321	Generate CRB Letter of Instruc.	0.7	38.4	0	303.4	0	3.9	0	0	0	0	0	0	0	0	0	0	0	0	0	3.6	0.8%	350.0
		A322	Develop Project Briefings	0	25.6	129.8	0	0	73.2	59.1	0	0	0	172.3	5.9	0	0	0	0	0	0	0	45.1	1.2%	511.0
		A323	Prepare CRB Read Ahead	0	0	0	202.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	414.1	1.5%	616.4
		A324	Conduct CRB Meeting	64.7	127.9	454.4	1011.3	0	0	0	0	0	0	0	0	26.4	0	281.6	0	0	0	0	16.1	4.7%	1,982.4
		A325	Prepare CRB Meeting Minutes	0.7	21.3	64.9	202.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.7%	289.2
		A326	Revise DD1391s	0	0	0	303.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	40	0.8%	343.4
	A33		Perform CRRC Review	0	15.221	0	77.792	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2%	93.0
	A34		Perform Technical Review	0	0	129.818	272.27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.9%	402.1
	A35		Obtain Higher Echelon Approvals	22	509.91	389.453	77.792	0	77.088	59.136	0	0	0	0	5.91	0	0	0	0	0	0	0	6.31537	2.7%	1,147.6
		A351	Obtain EXCOM Approval	22	10.198	0	15.558	0	15.418	11.827	0	0	0	0	1.18	0	0	0	0	0	0	0	0	0.2%	76.2
		A352	Obtain BoD Approval	0	10.198	0	15.558	0	15.418	11.827	0	0	0	0	1.18	0	0	0	0	0	0	0	6.31537	0.1%	60.5
		A353	Obtain OASA Approval	0	101.98	194.726	15.558	0	15.418	11.827	0	0	0	0	1.18	0	0	0	0	0	0	0	0	0.8%	340.7
		A354	Obtain OSC Approval	0	193.77	0	15.558	0	15.418	11.827	0	0	0	0	1.18	0	0	0	0	0	0	0	0	0.6%	237.8
		A355	Obtain HASC Approval	0	193.77	194.726	15.558	0	15.418	11.827	0	0	0	0	1.18	0	0	0	0	0	0	0	0	1.0%	432.5
	A36		Prepare "Greenbook"	0	22.832	129.818	1439.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3.8%	1,591.8
		A361	Edit Final DD1391s	0	0	0	1151.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.7%	1,151.3
		A362	Update CAPSES Database	0	0	0	172.7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4%	172.7
		A363	Consolidate All Army NAF Proj	0	11.416	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%	11.4
		A364	Generate Drft Greenbook Rpt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%	0.0
		A365	Review Draft Greenbook Report	0	11.416	64.9088	115.13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5%	191.5
		A366	Produce Final Greenbook Report	0	0	64.9088	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2%	64.9
A4			Manage Project Execution	0	380.53	10125.8	0	1056	0	270.34	33.8	2591.8	33.8	110.62	27	238	2640	4505.6	35.2	704	141	88	681.069	55.9%	23,662.0
	A41		Manage Design/Bid/Construct	0	114.16	6075.46	0	316.8	0	135.17	4.06	103.67	4.06	55.31	13.5	0	0	0	0	0	0	0	582.314	17.5%	7,404.5

NAFMC ACTIVITY-BASED COSTING WORKSHEET

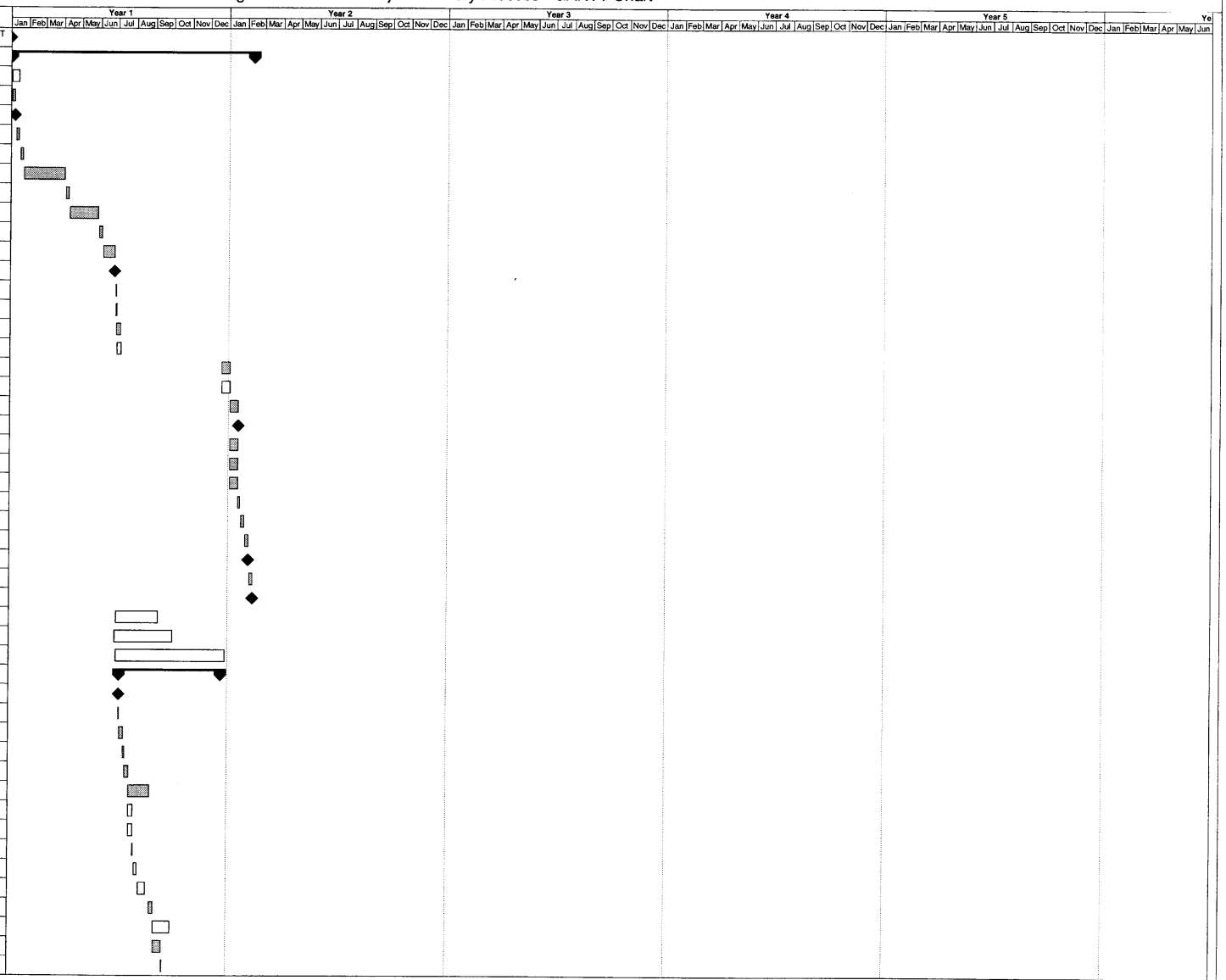
				CS	CO	COE	COP	COD	BP	BPA	NC	NCC	NCP	CR	FS	RM	RMA	RMC	RMI	RMM	JA	IR	FORSCOM	%	TOTALS
			FTE Staffing	1	1	8	4	6	1	4	1	2.3	1	2	1	1	6	8	1	2	2	1	3		
			Total Available Hours	1760	1760	14080	7040	10560	1760	7040	1760	4065.6	1760	3520	1760	1760	10560	14080	1760	3520	3520	1760	5280		99,105.6
			% Time on NAFMC	0.05	0.7207	0.922	0.85	0.1	0.12	0.24	0.03	0.85	0.03	0.3948	0.1	0.15	0.25	0.4	0.02	0.2	0.05	0.05	0.8376		
			Total Allocatable Hours	88	1268.4	12981.8	5984	1056	211.2	1689.6	52.8	3455.8	52.8	1389.7	169	264	2640	5632	35.2	704	176	88	4422.53	100.0%	42,361.7
	A411		Acquire A/E Firm	0	37.672	607.546	0	0	0	0	1.01	41.469	1.01	0	0	0	0	0	0	0	0	0	0	1.6%	688.7
		A4111	Develop SOW	0	12.432	364.528	0	0	0	0	1.01	41.469	1.01	0	0	0	0	0	0	0	0	0	0	0	1.0%	
		A4112	Issue Code 1 Directive	0	12.432	121.509	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3%	
		A4113	Issue Code 2 Directive	0	12.809	121.509	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3%	
	A412		Design Facility	0	10.274	3037.73	0	190.08	0	135.17	0.53	0	0.53	55.31	13.5	0	0	0	0	0	0	0	0	8.1%	3,443.1
		A4121	Conduct Pre-Design Meeting	0	0	303.773	0	0	0	135.17	0.26	0	0.26	55.31	13.5	0	0	0	0	0	0	0	0	1.2%	
		A4122	Conduct Design & Development	0	10.274	2430.19	0	190.08	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6.2%	
		A4123	Develop Construction Budget	0	0	151.887	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4%	
		A4124	Certify Adveritisement Funds	0	0	151.887	0	0	0	0	0.26	0	0.26	0	0	0	0	0	0	0	0	0	0	0.4%	
	A413		Acquire Construction Contractor	0	10.274	607.546	0	126.72	0	0	1.5	20.735	1.5	0	0	0	0	0	0	0	0	0	0	1.8%	768.3
	A414		Construct Facility	0	51.371	1822.64	0	0	0	0	1.01	41.469	1.01	0	0	0	0	0	0	0	0	0	582.314	5.9%	2,499.8
A42			Manage Design/Build	0	114.16	2025.15	0	739.2	0	67.584	29.7	2488.1	29.7	27.655	6.76	0	0	0	0	0	141	79.2	87.1769	13.8%	5,835.3
	A421		Develop RFP	0	50.23	607.546	0	517.44	0	0	9.52	821.09	9.52	0	0	0	0	0	0	0	35.2	0	0	4.8%	2,050.5
	A422		Acquire D/B Contractor	0	25.115	810.062	0	110.88	0	0	14.3	1169.4	14.3	0	0	0	0	0	0	0	70.4	79.2	0	5.4%	2,293.6
		A4221	Certify Advertisement Funds	0	12.557	40.5031	0	0	0	0	0.57	11.694	0.57	0	0	0	0	0	0	0	0	0	0	0.2%	
		A4222	Advertise Project	0	0	121.509	0	0	0	0	0.57	46.777	0.57	0	0	0	0	0	0	0	0	0	0	0.4%	
		A4223	Perform Solicitation Process	0	0	486.037	0	110.88	0	0	12.6	1064.2	12.6	0	0	0	0	0	0	0	35.2	0	0	4.1%	
		A4224	Award D/B Contract	0	12.557	162.012	0	0	0	0	0.57	46.777	0.57	0	0	0	0	0	0	0	35.2	79.2	0	0.8%	
	A423		Execute D/B Contract	0	38.814	607.546	0	110.88	0	67.584	5.95	497.63	5.95	27.655	6.76	0	0	0	0	0	35.2	0	87.1769	3.5%	1,491.1
		A4231	Conduct Pre-Design Meeting	0	0	60.7546	0	55.44	0	0	0.54	44.787	0.54	0	0	0	0	0	0	0	0	0	10.9843	0.4%	
		A4232	Design Project	0	0	121.509	0	0	0	67.584	0.54	44.787	0.54	27.655	6.76	0	0	0	0	0	0	0	0	0.6%	
		A4233	Administer D/B Contract	0	12.809	182.264	0	55.44	0	0	4.34	363.27	4.34	0	0	0	0	0	0	0	35.2	0	10.0253	1.6%	
		A4234	Construct Facility	0	0	60.7546	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1%	
		A4235	Monitor Construction	0	26.005	151.887	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	45.0704	0.5%	
		A4236	Take Ownership of Facility	0	0	30.3773	0	0	0	0	0.54	44.787	0.54	0	0	0	0	0	0	0	0	0	21.0096	0.2%	
A43			Manage Project Finances	0	102.74	1012.58	0	0	0	0	0	0	0	0	0	238	2640	4505.6	35.2	704	0	8.8	0	21.8%	9,246.5
	A431		Certify Funds	0	51.371	405.031	0	0	0	0	0	0	0	0	0	131	0	3604.5	0	70.4	0	0	0	10.1%	4,262.0
	A432		Account for Project Funds	0	39.042	405.031	0	0	0	0	0	0	0	0	0	0	2376	0	0	0	0	8.8	0	6.7%	2,828.9
	A433		Prepare AMWRF Cash Flow	0	12.329	0	0	0	0	0	0	0	0	0	0	107	0	270.34	0	634	0	0	0	2.4%	1,023.2
	A434		Close-Out Project Finances	0	0	202.515	0	0	0	0	0	0	0	0	0	0	264	630.78	35.2	0	0	0	0	2.7%	1,132.5
A5			Perform Post Occupancy Assessmt	0	25.369	129.818	0	0	8.448	67.584	0	0	0	27.794	6.76	0	0	281.6	0	0	0	0	92.8731	1.5%	640.2
A51			Perform Financial Analysis	0	0	0	0	0	0	16.896	0	0	0	6.9485	1.69	0	0	168.96	0	0	0	0	27.5833	0.5%	222.1
A52			Perform Program Analysis	0	0	0	0	0	0	16.896	0	0	0	6.9485	1.69	0	0	0	0	0	0	0	48.9441	0.2%	74.5
A53			Perform Cost Analysis	0	12.684	0	0	0	0	16.896	0	0	0	6.9485	1.69	0	0	0	0	0	0	0	8.17283	0.1%	46.4
A54			Prepare Briefing to CRB & Fin Com	0	12.684	129.818	0	0	8.448	16.896	0	0	0	6.9485	1.69	0	0	112.64	0	0	0	0	8.17283	0.7%	297.3

APPENDIX D

Current Design-Bid-Construct and Design-Build Processes

NAFMC Design-Bid-Construct Project Delivery Process - GANTT Chart

ID	Task Name	Responsible	Description
1	Start		Begin NAF Major Construction - DESIGN BID CONSTRUCT
2	**Program Development Phase**		
3	Prog Dev0	Install/DPCA	Develops installation's NAFMC requirements
4	Prog Dev1	CFSC-RM	Develops & issues NAFMC funding guidance
5	Program Amt		NAF construction program amount established
6	Prog Dev2	CFSC-CO	Prepares & issues NAF program guidance to MACOMs
7	Prog Dev3	MACOMs	Forward program guidance & request project listing
8	Prog Dev4	install/DPCA	Finalizes NAFMC requirements & prepares DD1391s
9	Prog Dev5	Install/DPCA	Consolidates & forwards DD1391s
10	Prog Dev6	MACOMs	Review, approve, & consolidate DD1391s
11	Prog Dev7	MACOMs	Forward 5-year program (DD1391s + fund certs)
12	Prog Dev8	CFSC-CO	Review, validate, & coordinate (DD1391s + fund certs)
13	NAFMC Requirements		NAFMC FY96 project submission finalized
14	Prog Dev9	CFSC-CO	Forwards projects to proponent (DD1391s + fund certs)
15	Prog Dev10	CFSC-CO	Assigns project responsibility to project manager
16	Prog Dev9a	Proponent	Assigns Program Manager (PGM)
17	Prog Dev11	CFSC-CO	PJMs review & assess technical validity
18	Prog Dev13a	CFSC-CO	Officially notifies users of CRB meeting
19	Prog Dev14a	CFSC-CO	Consolidates PVA executive summaries
20	Prog Dev13	Install/MACOI	Prepares CRB project briefings
21	Prog Dev 17a	CRB	CRB Meeting
22	Prog Dev14	CFSC-CO	Prepares for Construction Review Board (CRB)
23	Prog Dev15	Proponents	Coordinates & supports user project development
24	Prog Dev16	Install/MACOI	Updates DD1391s and forward to CFSC
25	Prog Dev17	MACOM/Insta	Briefs CRB on each project
26	Prog Dev18	CRB	Reviews, prioritizes, & recommends approvals
27	Prog Dev19	SPC	Reviews and approves project submissions
28	Program Complete		NAFMC program finalized and TOA set
29	Prog Dev20	Install/MACOI	Updates DD1391s per CRB recommendations
30	End ProgDev		End of Program development phase
31	Prog Dev21	CFSC-CO	Tracks projects requiring estimate only
32	Prog Dev12	Install/MACOI	Modify projects and coordinate with PGMs
33	Prog Dev22	CFSC-CO	Tracks projects having PVA & estimate waivered
34	**PVA Development Phase**		
35	Begin PVA		Begin project validation assessment process
36	PVA1	Proponent	PGMs prepare fund cert verification memo
37	PVA2	CFSC-RM	Verifies fund certs & returns to PGMs
38	PVA3	Proponent	PGMs prepare purchase reqs & forward to KO
39	PVA4	CFSC-NC	Selects & notifies PVA contractor (PVAC)
40	PVA5	PVAC	Prepares for site visit and market analysis
41	PVA8	Proponent	Prepares Invitational Travel Orders
42	PVA6a	CFSC-CO	Assembles project documentation
43	PVA6	CFSC-CO	Sends docs to & notifies USACE of site visit
44	PVA7	USACE POC	Assigns district & issues 'limited' code 1
45	PVA8	USACE Dist.	Prepares for site visit & identifies resources
46	PVA10	PVA Team	Conducts site visit & performs customer survey
47	PVA10a	PVAC	Begins analysis of installation data
48	PVA11	PVAC	Prepares project scope statement
49	PVA12	PVAC	Sends completed project scope to PGM

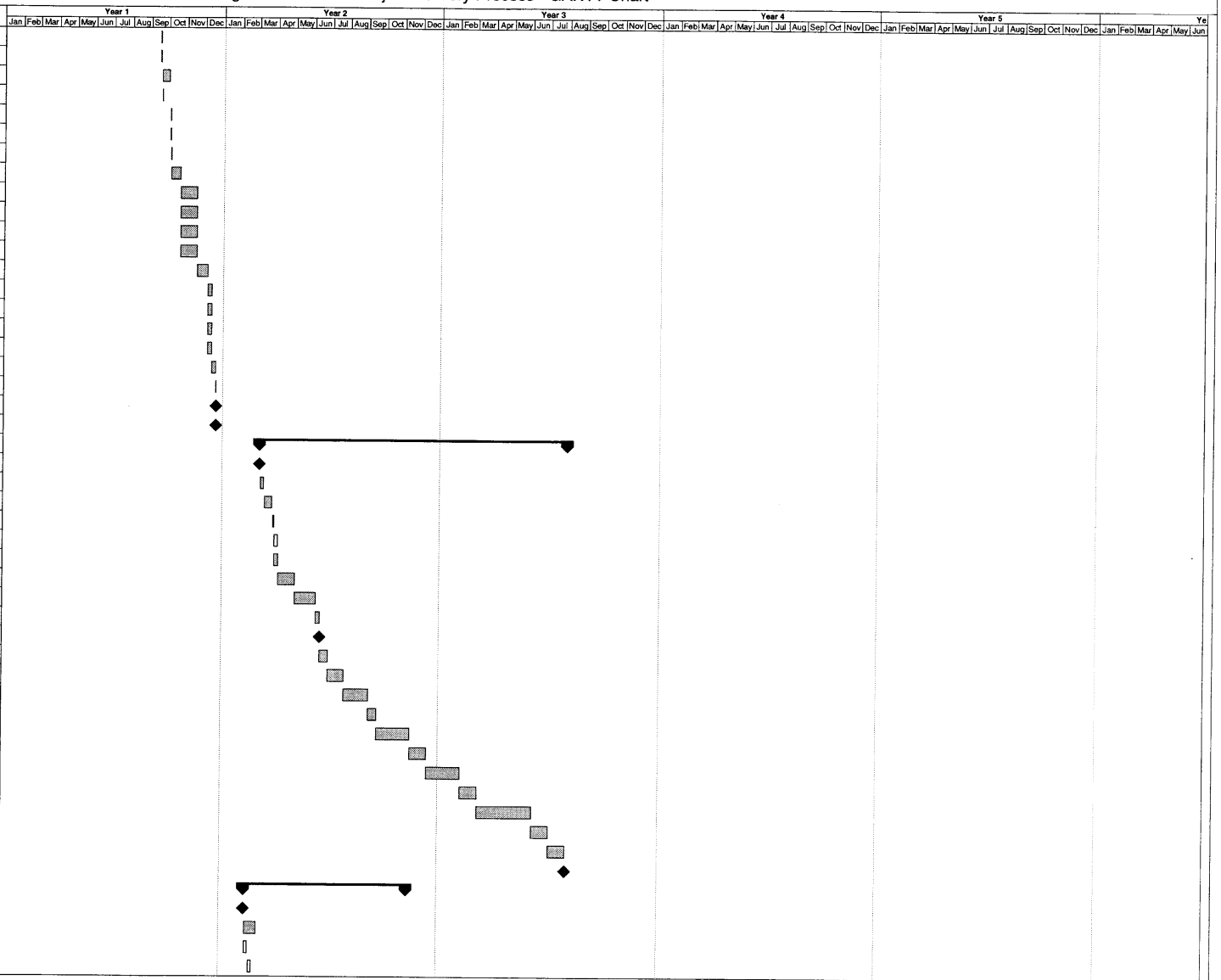


Project: NAFMC Design-Bid-Construct
Date: Nov 14 '94

Critical Task | Non-critical | Milestone | Summary

NAFMC Design-Bid-Construct Project Delivery Process - GANTT Chart

ID	Task Name	Responsible	Description
50	PVA13	PVAC	Send project scope to project manager
51	PVA14	PVAC	Sends scope to USACE project manager
52	PVA15	USACE Dist.	Estimates project costs
53	PVA15a	USACE Dist.	Estimates costs for waivered projects
54	PVA16	USACE POC	Sends completed cost estimate to PJM
55	PVA17	USACE POC	Sends completed cost estimate to PGM
56	PVA18	Proponent	PGM sends cost estimate to PVAC
57	PVA19	PVAC	Prepare draft PVA report & finalizes ROI template
58	PVA20	Proponent	PGM reviews draft report & consolidates comments
59	PVA21	Install/MACOI	Reviews draft report & provides comments to PGM
60	PVA22	CFSC-RM	Reviews ROI template & provides comments to PGM
61	PVA23	CFSC-CO	PJM reviews draft report & comments to PGM
62	PVA24	PVAC	Prepares final report and forwards to PGM
63	PVA25	Proponent	Reviews final PVA report & comments to PVAC
64	PVA26	CFSC-RM	Reviews final report & comments to PVAC
65	PVA27	CFSC-CO	Reviews final report & comments to PVAC
66	PVA28	Install/MACOI	Reviews final report & comments to PVAC
67	PVA29	PVAC	Makes final changes & issues to PGM
68	PVA30	Proponent	Sends final PVA report to users
69	PVA Report		PVA Report complete
70	END PVA		End of the PVA process
71	**Design Phase**		
72	Begin Design		Begin the A/E acquisition and design phase
73	Design0	CFSC-CO	Seeks design start approval from ASAs
74	Design00	ASA(IL&E)	Provides selective design start approvals
75	Design1	CFSC-CO	Provides USACE funding & authorizations
76	Design2	CFSC-CO	Requests USACE POC to issue code 1 directive
77	Design3	USACE POC	Assigns USACE district & issues code 1 directive
78	Design4	USACE Dist.	Develops criteria & prepares CBD announcements
79	Design 4A	A/E Contracto	Responds to CBD announcement
80	Design5	A/E Board	Selects most qualified A/E firm to do design
81	A/E Selected		A/E firm is selected
82	Design6	USACE Dist.	Schedules & convenes pre- negotiation conference
83	Design6a	A/E	Prepares proposal
84	Design7	USACE & A/E	Negotiates design fee
85	Design8	USACE Dist.	Awards design contract to A/E firm
86	Design9	A/E	Prepares facility design to 10% completion
87	Design10	USACE/CFSC	Reviews & approves 10% design submittal
88	Design11	A/E	Prepares facility design to 35% completion
89	Design12	USACE/CFSC	Reviews & approves 35% design submittal
90	Design13	A/E	Prepares facility design to 95% completion
91	Design14	USACE/CFSC	Reviews & approves 95% design submittal
92	Design15	A/E	Finalizes design & bid documentation
93	End Design		100% design complete & ready for advertisement
94	**Review & Approval Phase**		
95	Begin PrgRev		Begin the program review and approval process
96	Prog Rev1	CFSC-CO	Reviews & updates DD1391s project submissions
97	Prog Rev2	EXCOM	Reviews & recommends NAF program funding approval
98	Prog Rev3	BoD	Reviews & approves NAF program funding

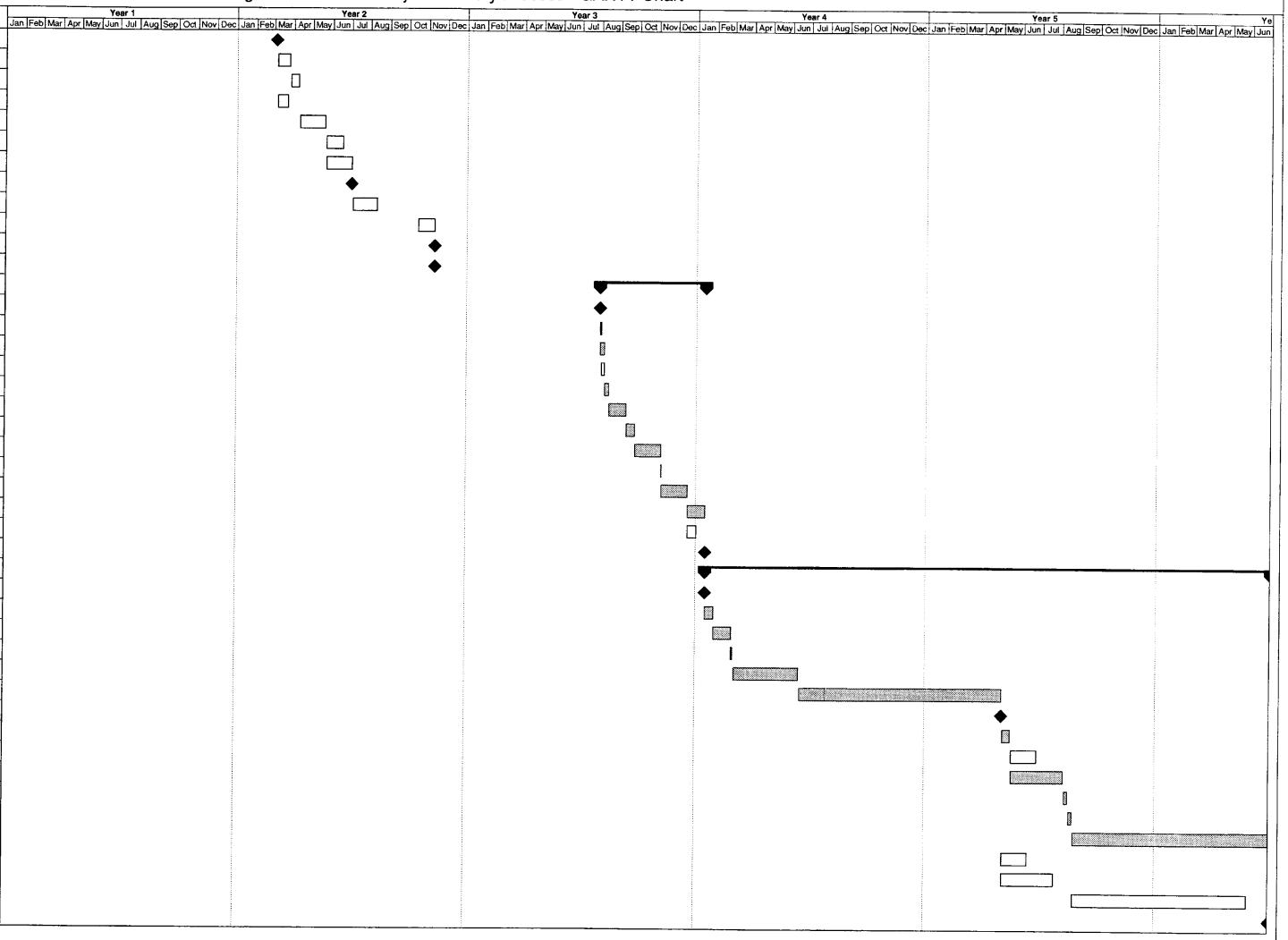


Project: NAFMC Design-Bid-Construct
Date: Nov 14 '94

Critical Task | Non-critical | Milestone | Summary

NAFMC Design-Bid-Construct Project Delivery Process - GANTT Chart

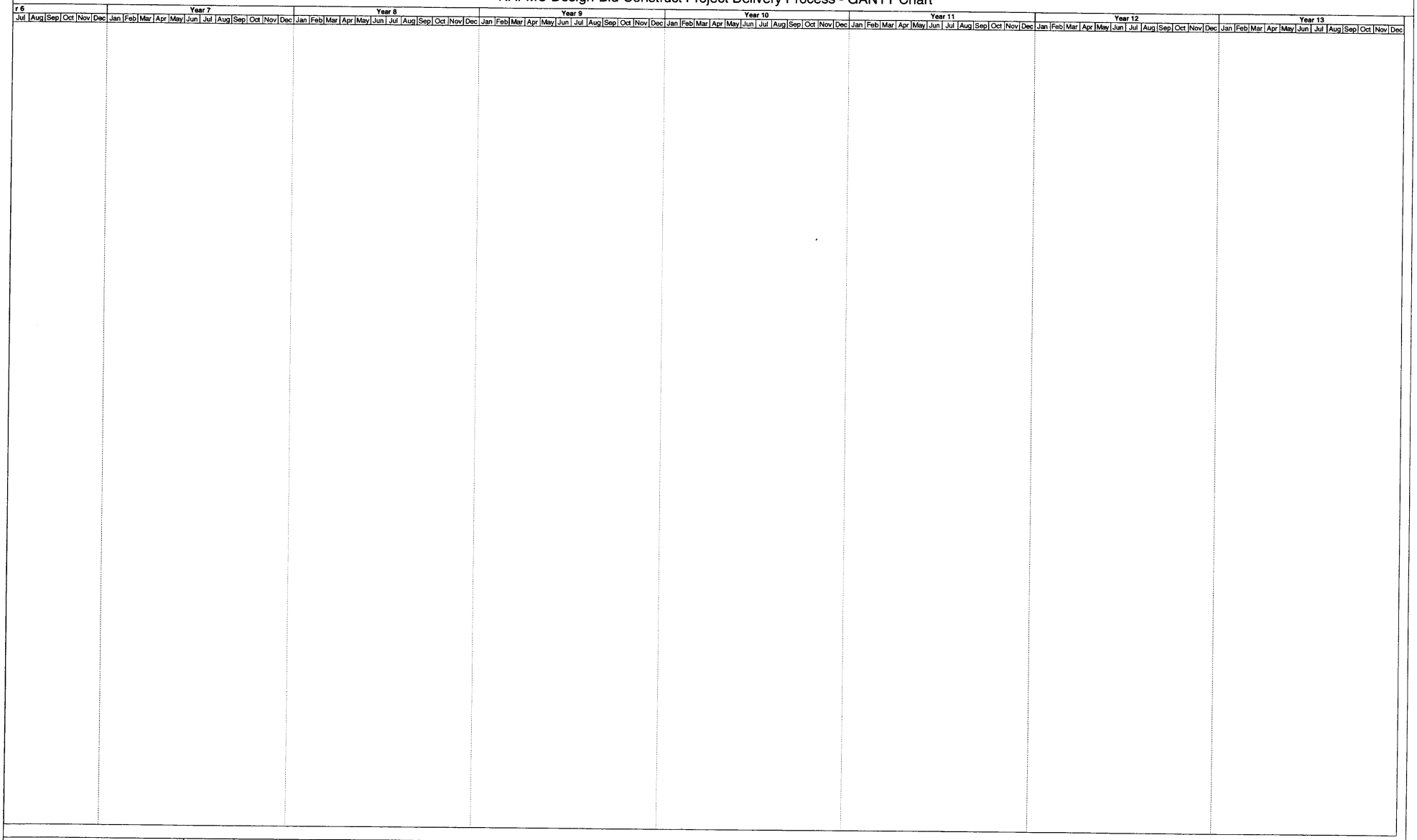
ID	Task Name	Responsible	Description
99	Funds Approval		NAFMC funding approved & TOA established
100	Prog Rev4	USACE	Tech review & verifies DD1391 project estimate
101	Prog Rev5	CRRC Subco	Reviews & approves project submissions
102	Proj Rev10	CFSC-CO	Consolidates/validates DD1391 submissions
103	Prog Rev7	USACE	Prepares NAF project 'Greenbook'
104	Prog Rev8	ASA(MR&A)	Reviews/ approves project submissions (greenbook)
105	Prog Rev9	ASA(L&E)	Reviews/ approves project submissions (greenbook)
106	Greenbook		Greenbook finalized and ready for approval
107	Prog Rev10	OASD(PSF&I	Review, approves, & consolidates NAF program
108	Prog Rev11	HASC	Subpanel reviews/ approves selective NAV program
109	Program Release		NAFMC program released for execution
110	End ProgRev		End of Program review phase
111	**Contractor Acquisition Phase**		
112	Begin GC Acq		Begin GC acquisition process
113	GC Acq1	CFSC-CO	Notifies USACE POC to issue code 9 directive
114	GC Acq3	CFSC-CO	Requests RM to provide construction fund cert
115	GC Acq2	USACE POC	Prepares for contract action - issues code 9
116	GC Acq4	CFSC-RM	Certifies adequate funds available for project
117	GC Acq5	USACE Dist.	Issues CBD advance notice
118	GC Acq6	USACE Dist.	Prepares solicitation & copies
119	GC Acq7	USACE Dist.	Advertises for construction contractors
120	GC Acq8	GC	Responds to bid/proposal requests
121	GC Acq9	USACE Dist.	Evaluates bids &selects GC
122	GC Acq10	USACE Dist.	Awards construction contract to GC
123	GC Acq11	USACE Dist.	Finalizes project management schedule
124	End GC Acq		End of GC acquisition process
125	**Construction Phase**		
126	Begin Construction		Begin construction phase
127	Construct1	USACE Dist.	Verifies bonds, PM schedule, GC plan, etc.
128	Construct2	USACE Dist.	Schedules & convenes preconstruction conference
129	Construct3	USACE Dist.	Issues notice to proceed (NTP) with construction
130	Construct4	GC	Mobilizes to job site
131	Construct5	GC	Constructs the facility
132	Fac Complete		Facility is substantially complete
133	Construct6	USACE Dist.	Performs prefinal inspection & punch list
134	Construct10	User	Occupies the facility
135	Construct7	GC	Corrects punch list deficiencies
136	Construct8	USACE Dist.	Performs final inspection & facility acceptance
137	Construct9	USACE Dist.	Accepts Facility
138	Construct 13a	User	Monitors warranty and guarantee period
139	Construct11	GC	Final Demobilization from the job site
140	Construct12	USACE Dist.	Responds to final modifications and claims
141	Construct13	USACE Dist.	Performs financial & contract close-out
142	END		NAF Major Construction Process Complete and Financial Clos



Project: NAFMC Design-Bid-Construct
Date: Nov 14 '94

Critical Task | Non-critical | Milestone | Summary

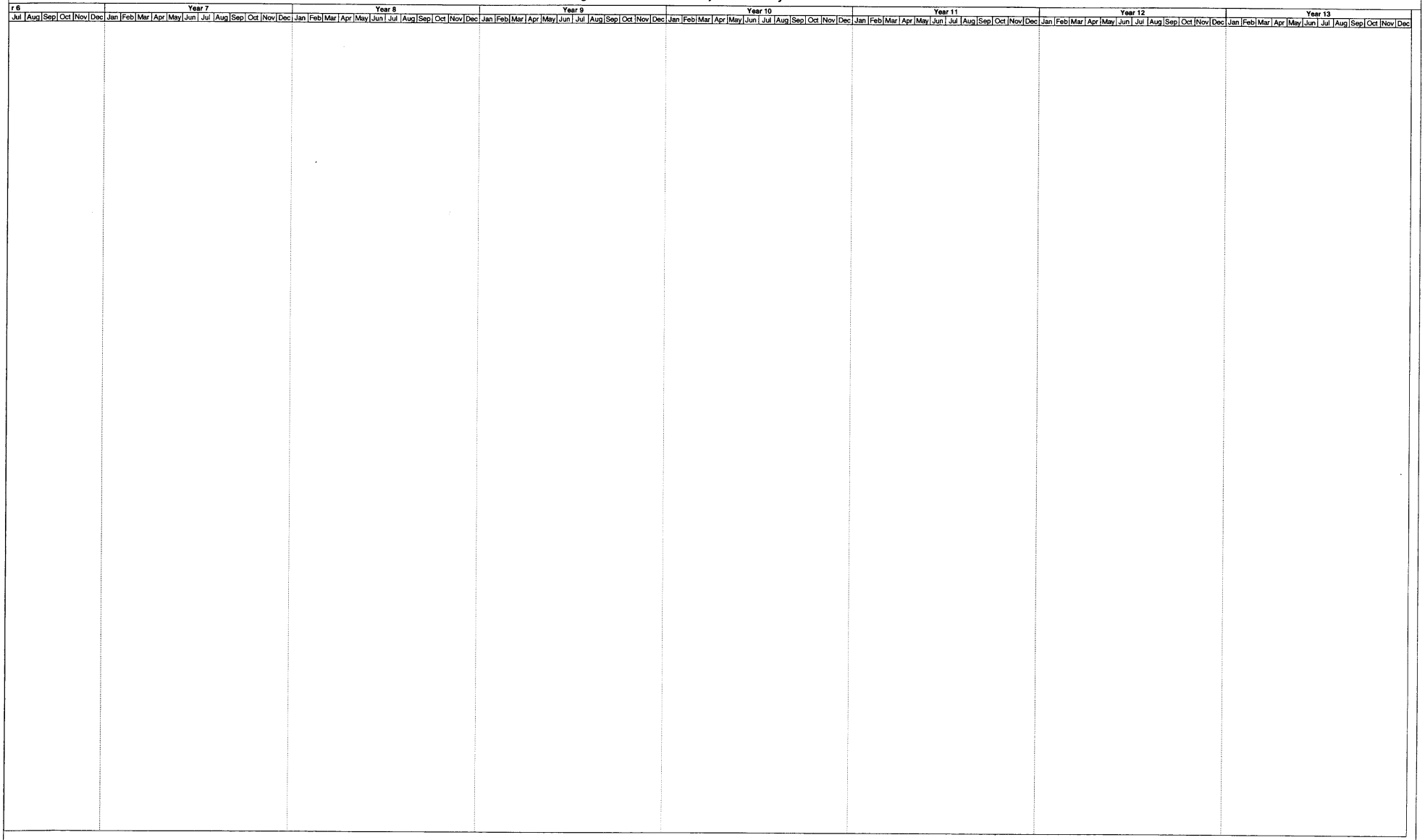
NAFMC Design-Bid-Construct Project Delivery Process - GANTT Chart



Project: NAFMC Design-Bid-Construct
Date: Nov 14 '94

Critical Task | Non-critical | Milestone | Summary

NAFMC Design-Bid-Construct Project Delivery Process - GANTT Chart



Project: NAFMC Design-Bid-Construct
Date: Nov 14 '94

Critical Task | Non-critical | Milestone | Summary

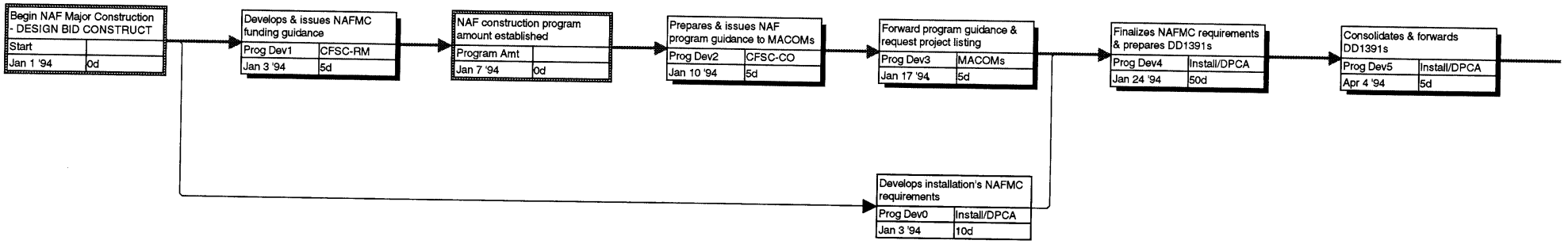
NAFMC Design-Bid-Construct Project Delivery Process - GANTT Chart

r 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13
Jul Aug Sep Oct Nov Dec	Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

Project: NAFMC Design-Bid-Construct
Date: Nov 14 '94

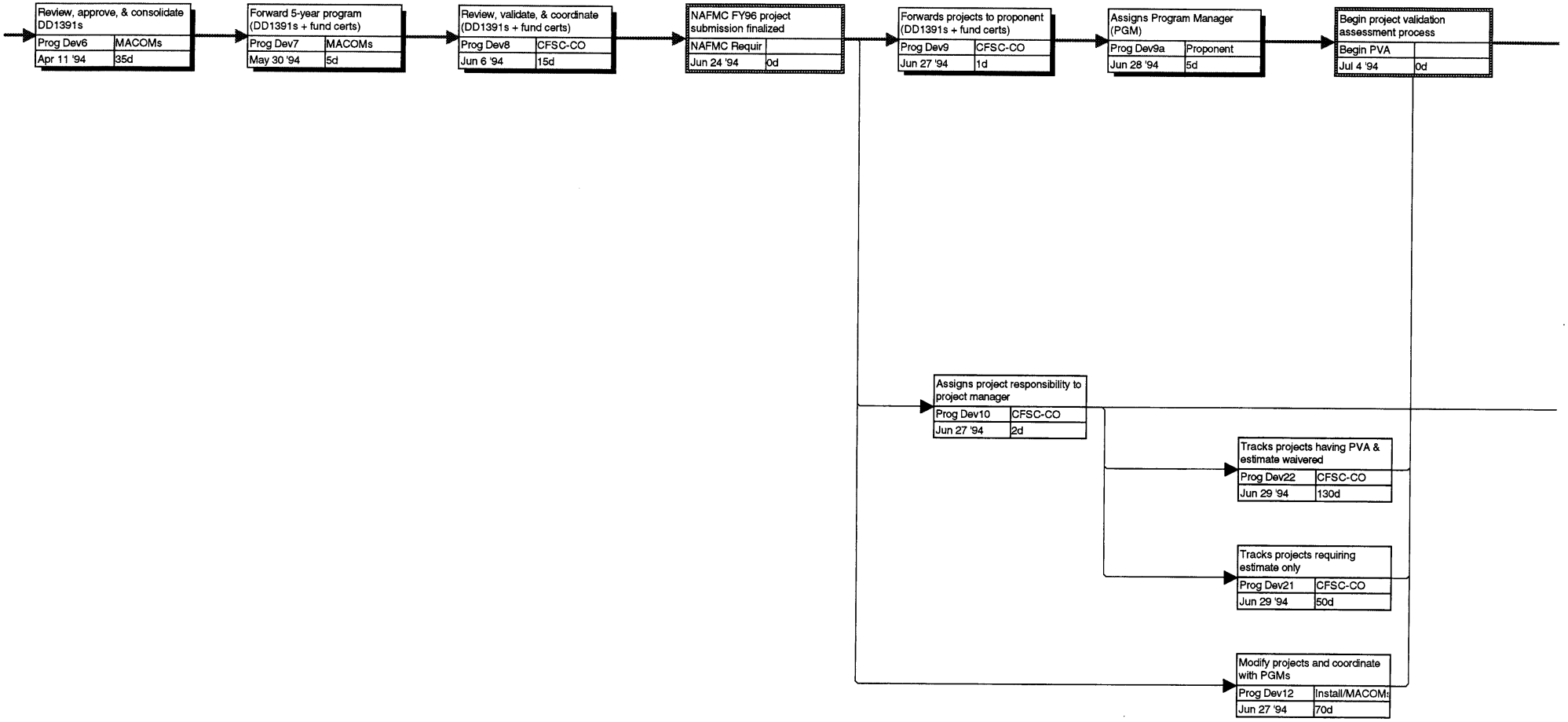
Critical Task | Non-critical | Milestone | Summary

NAFMC Design-Bid-Construction Project Delivery Process

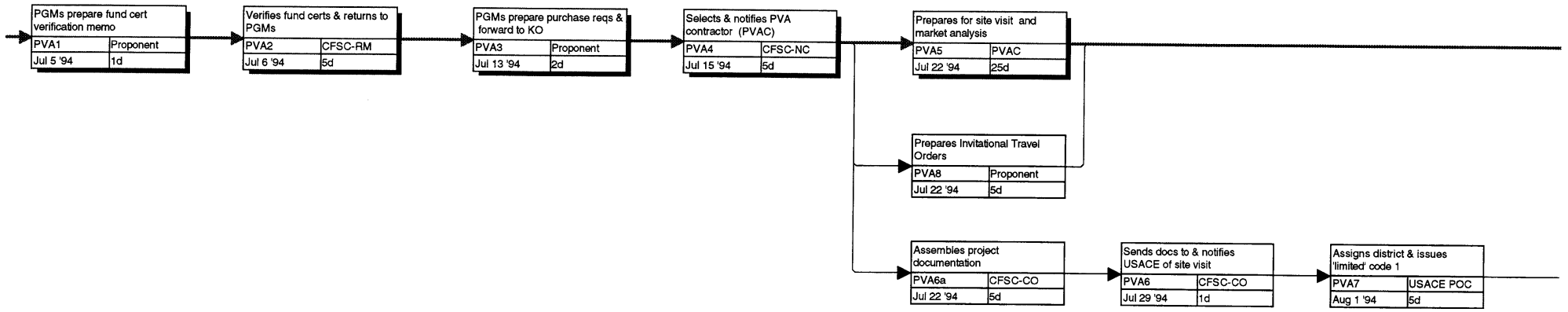


Aug 23 '94

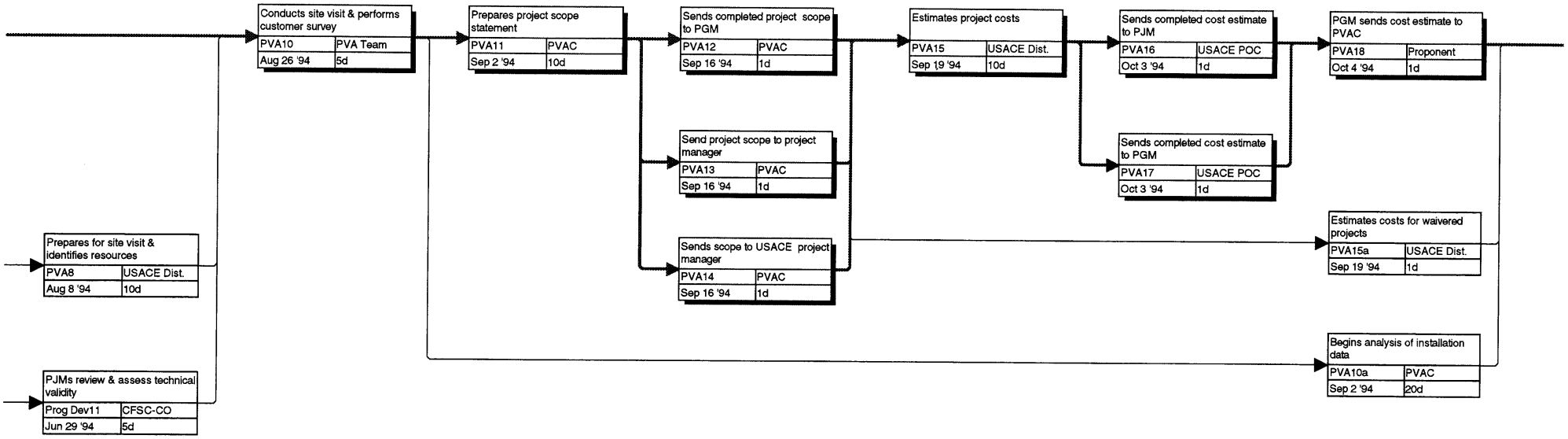
NAFMC Design-Bid-Construction Project Delivery Process



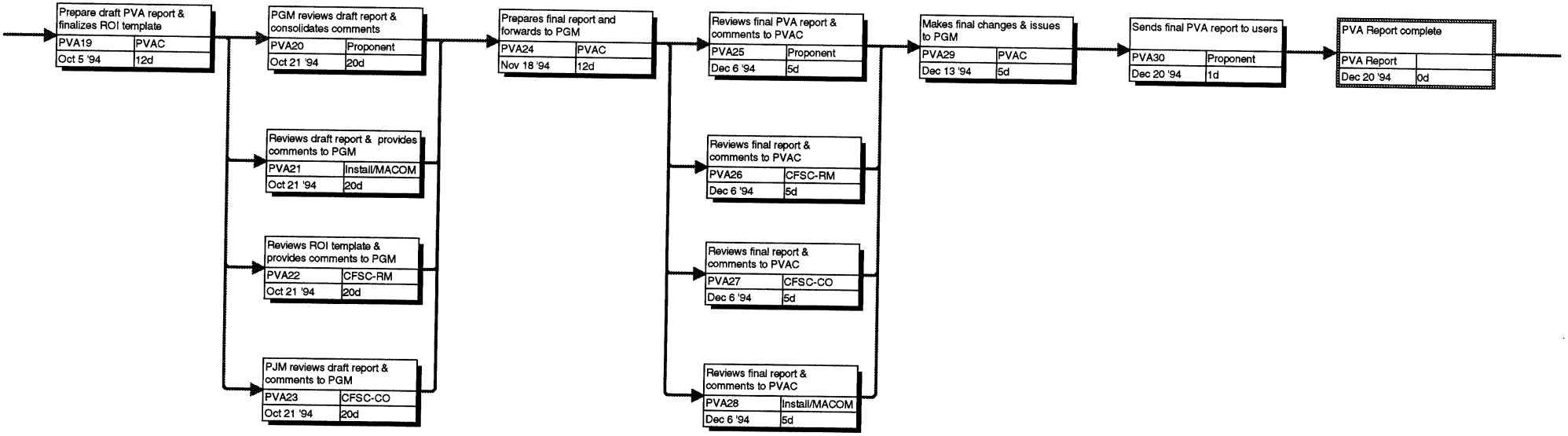
NAFMC Design-Bid-Construction Project Delivery Process



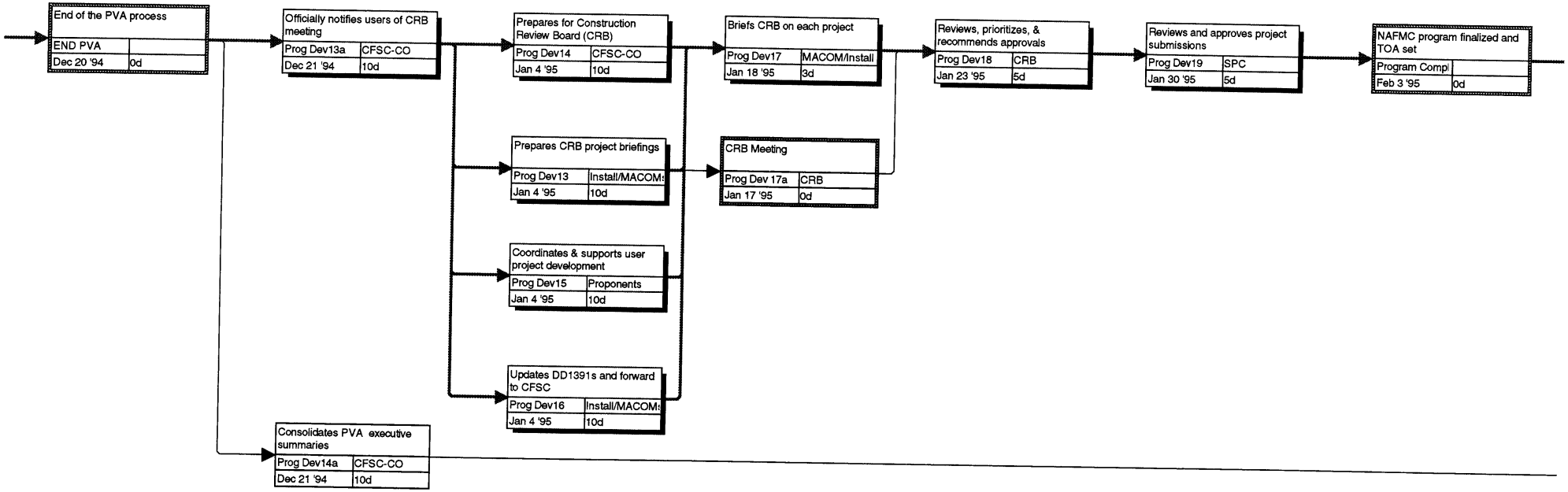
NAFMC Design-Bid-Construction Project Delivery Process



NAFMC Design-Bid-Construction Project Delivery Process



NAFMC Design-Bid-Construction Project Delivery Process



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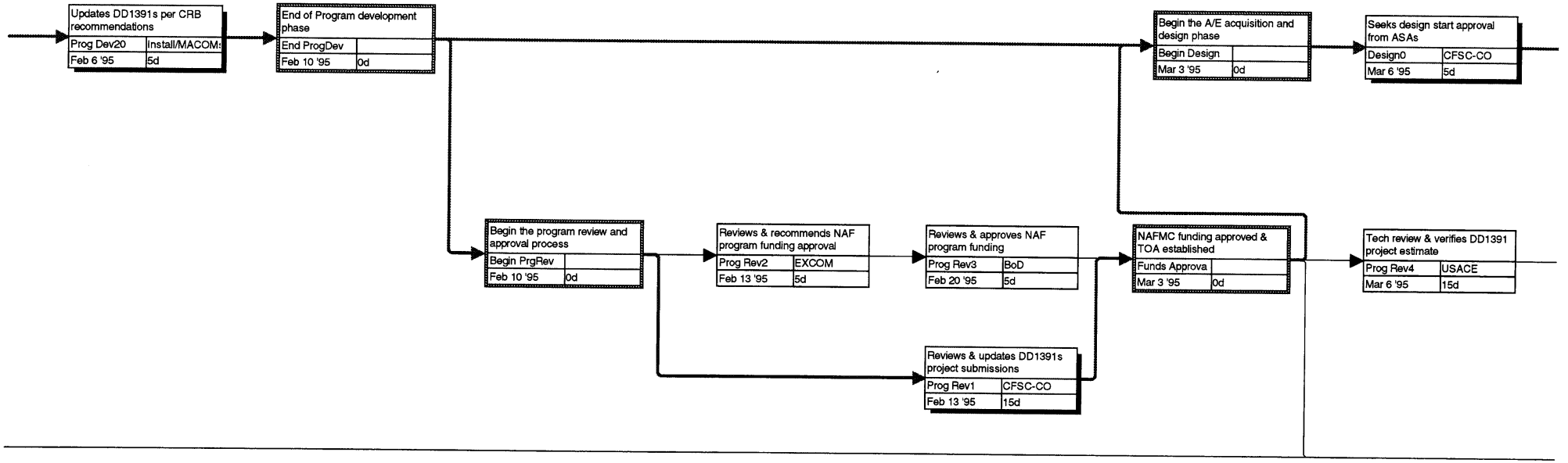

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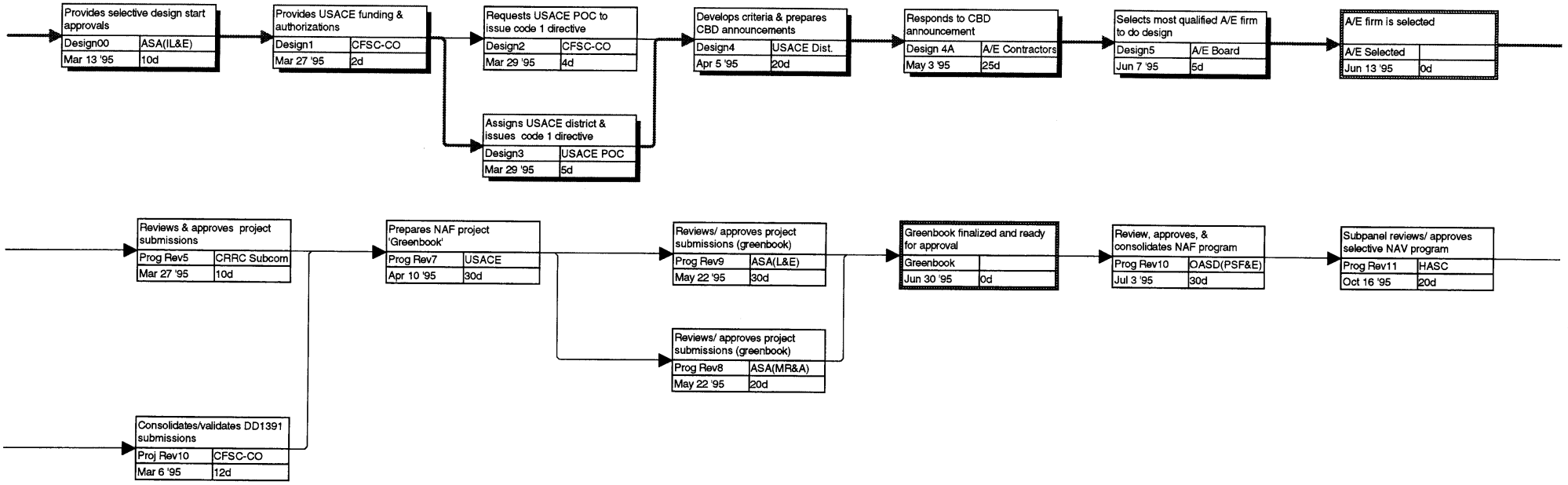
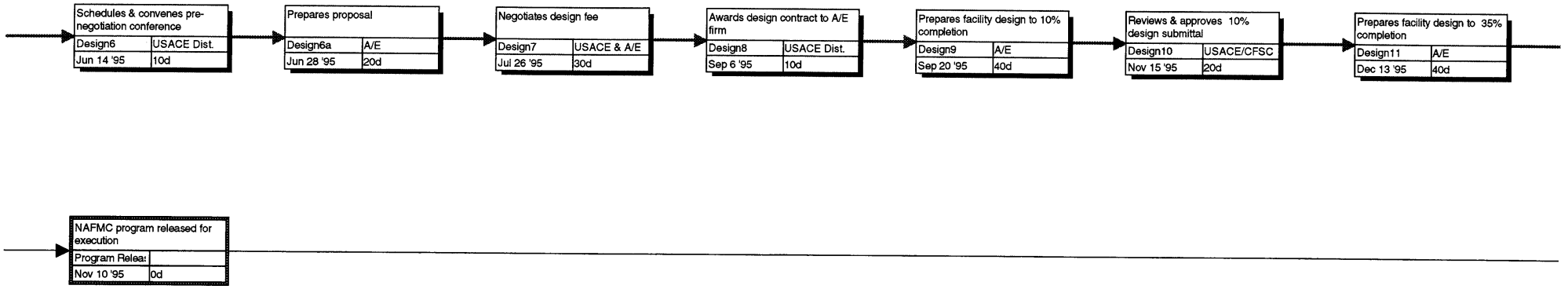


NAFMC Design-Bid-Construction Project Delivery Process



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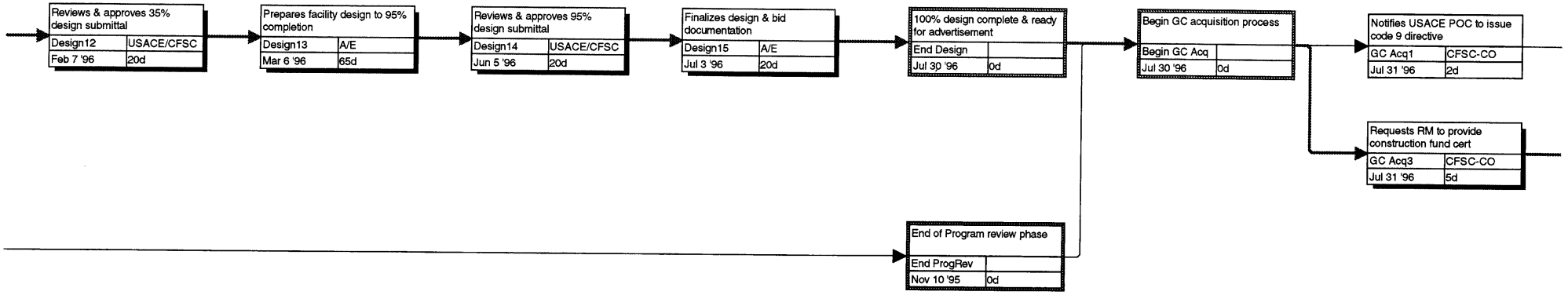

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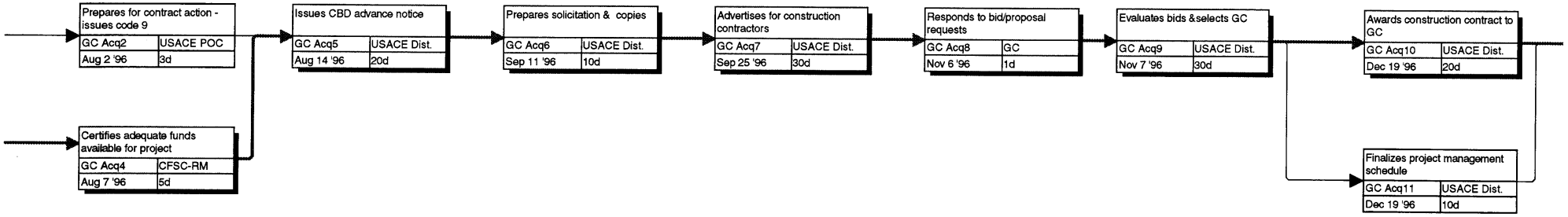

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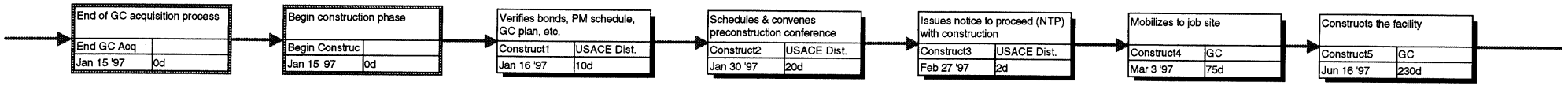

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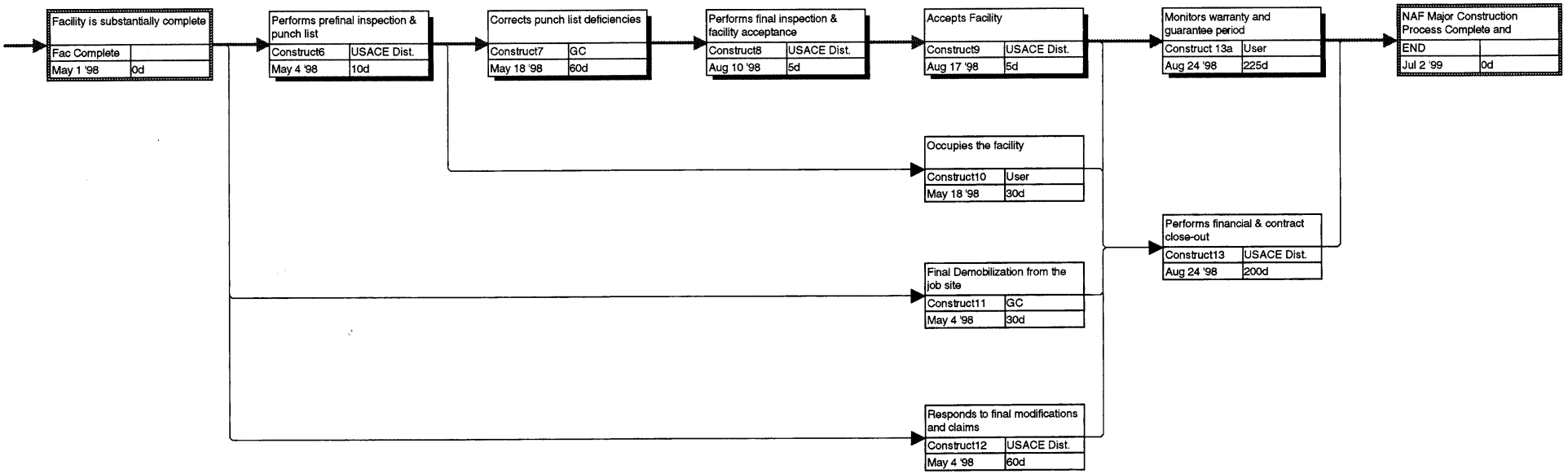
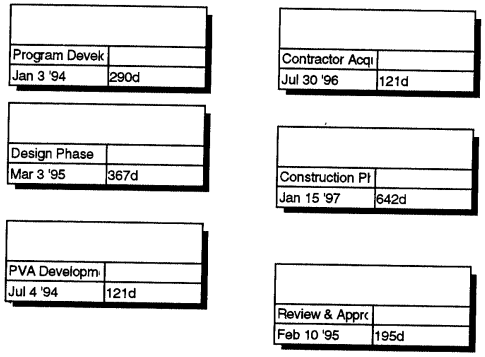
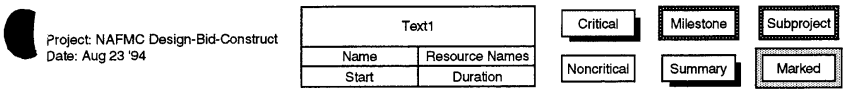


NAFMC Design-Bid-Construction Project Delivery Process

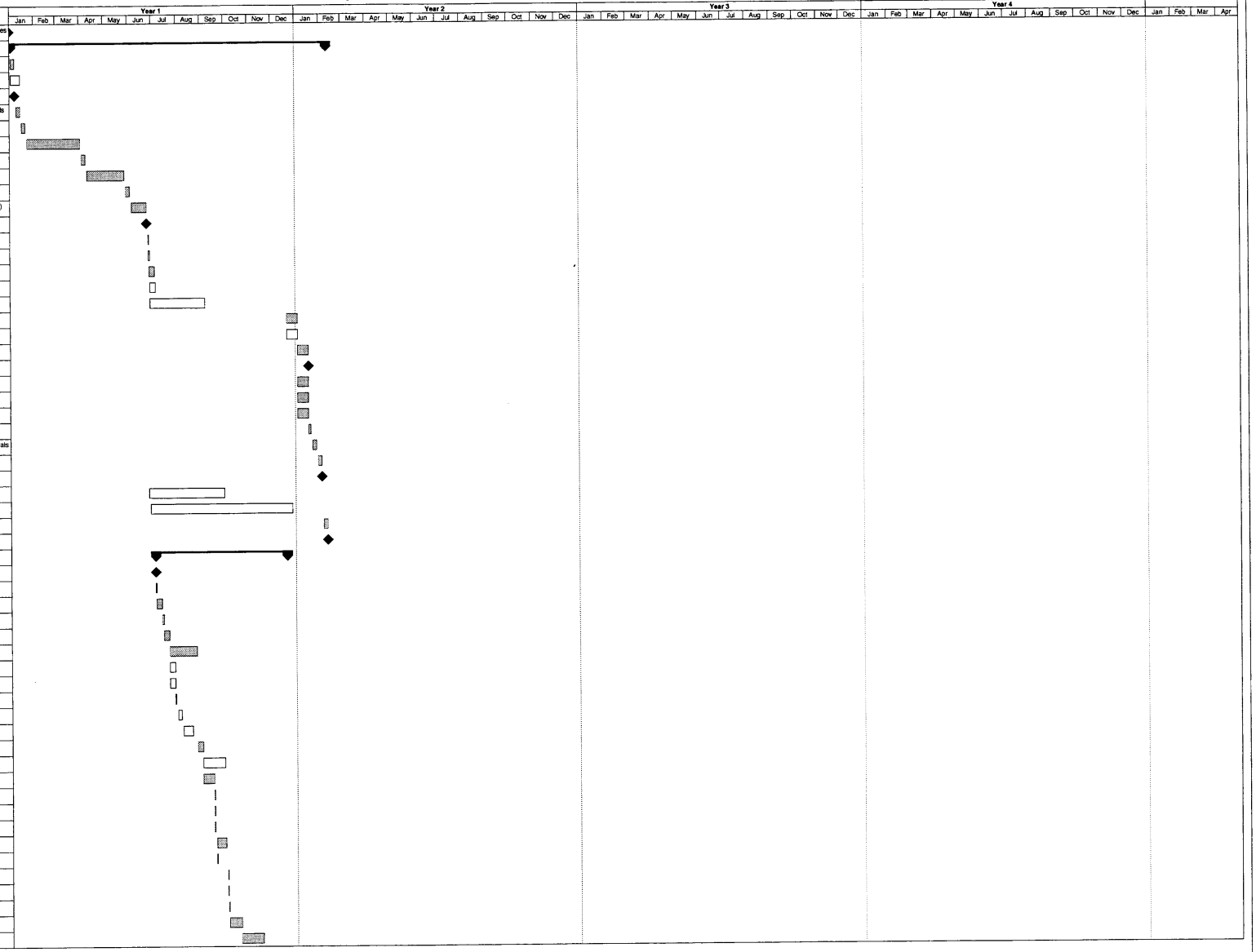


NAFMC Design-Bid-Construction Project Delivery Process



NAFMC Design-Build Project Delivery Process - GANTT Chart

ID	Task Name	Responsible	Description
1	Start		Begin NAF Major Construction - DESIGN-BUILD Proces
2	**Program Development Phase**		
3	Prog Dev1	CFSC-RM	Develops & issues NAFMC funding guidance
4	Prog Dev0	Install/DPCA	Develops installation's NAFMC requirements
5	Program Amt		NAF construction program amount established
6	Prog Dev2	CFSC-CO	Prepares & issues NAF program guidance to MACOMs
7	Prog Dev3	MACOMs	Forward program guidance & request project listing
8	Prog Dev4	Install/DPCA	Finalizes NAFMC requirements & prepares DD1391s
9	Prog Dev5	Install/DPCA	Consolidates & forwards DD1391s to MACOMs
10	Prog Dev6	MACOMs	Review, approve, & consolidate DD1391s
11	Prog Dev7	MACOMs	Forward 5-year program (DD1391s + fund certs)
12	Prog Dev8	CFSC-CO	Review, validate, & coordinate (DD1391s + fund certs)
13	NAFMC Requirements		NAFMC FY96 project submission finalized
14	Prog Dev9	CFSC-CO	Forwards projects to proponent
15	Prog Dev10	CFSC-CO	Assigns project responsibity to project manager
16	Prog Dev9a	Proponent	Assigns Program Manager (PGM)
17	Prog Dev11	CFSC-CO	PJMs review & assess technical validity
18	Prog Dev21	CFSC-CO	Tracks projects requiring estimate only
19	Prog Dev13a	CFSC-CO	Officially notifies users of CRB meeting
20	Prog Dev14a	CFSC-CO	Consolidates PVA executive summaries
21	Prog Dev13	Install/MACOM	Prepares CRB project briefings
22	CRB	CRB	CRB Meeting
23	Prog Dev14	CFSC-CO	Prepares for Construction Review Board (CRB)
24	Prog Dev15	Proponents	Coordinates & supports user project development
25	Prog Dev16	Install/MACOM	Updates DD1391s and forward to CFSC
26	Prog Dev17	MACOM/Install	Briefs CRB on each project
27	Prog Dev18	CRB	Reviews, prioritizes, and recommends project approvals
28	Prog Dev19	SPC	Reviews & approves project submissions
29	Program Complete		NAFMC program finalized and TOA set
30	Prog Dev12	Install/MACOM	Modify projects and coordinate with PGMs
31	Prog Dev22	CFSC-CO	Tracks projects having PVA & estimate waivered
32	Prog Dev20	Install/MACOM	Updates DD1391s per CRB recommendations
33	End ProgDev		End of Program development phase
34	**PVA Development Phase**		
35	Begin PVA		Begin project validation assessment process
36	PVA1	Proponent	PGMs prepare fund cert verification memo
37	PVA2	CFSC-RM	Verifies fund certification verification memo
38	PVA3	Proponent	PGMs prepare purchase reqs & forward to KO
39	PVA4	CFSC-NC	Selects & notifies PVA contractor (PVAC)
40	PVA5	PVAC	Prepares for site visit and market analysis
41	PVA8	Proponent	Prepares Invitational Travel Orders
42	PVA6a	CFSC-CO	Assembles project documentation
43	PVA6	CFSC-CO	Sends docs to & notifies USACE of site visit
44	PVA7	USACE POC	Assigns district & issues 'limited' code 1
45	PVA8	USACE Dist.	Prepares for site visit & identifies resources
46	PVA10	PVA Team	Conducts site visit & performs customer survey
47	PVA10a	PVAC	Performs analysis of installation data
48	PVA11	PVAC	Prepares project scope statement
49	PVA12	PVAC	Sends completed project scope to PGM
50	PVA13	PVAC	Sends project scope to project manager
51	PVA14	PVAC	Sends scope to USACE project manager
52	PVA15	USACE Dist.	Estimates project costs and forwards to CFSC
53	PVA15a	USACE Dist.	Estimates costs for waivered projects
54	PVA16	USACE POC	Sends completed cost estimate to PJM
55	PVA17	USACE POC	Sends completed cost estimate to PGM
56	PVA18	Proponent	PGM sends cost estimate to PVAC
57	PVA19	PVAC	Prepare draft PVA report & finalizes ROI template
58	PVA20	Proponent	PGM reviews draft report & consolidates comments

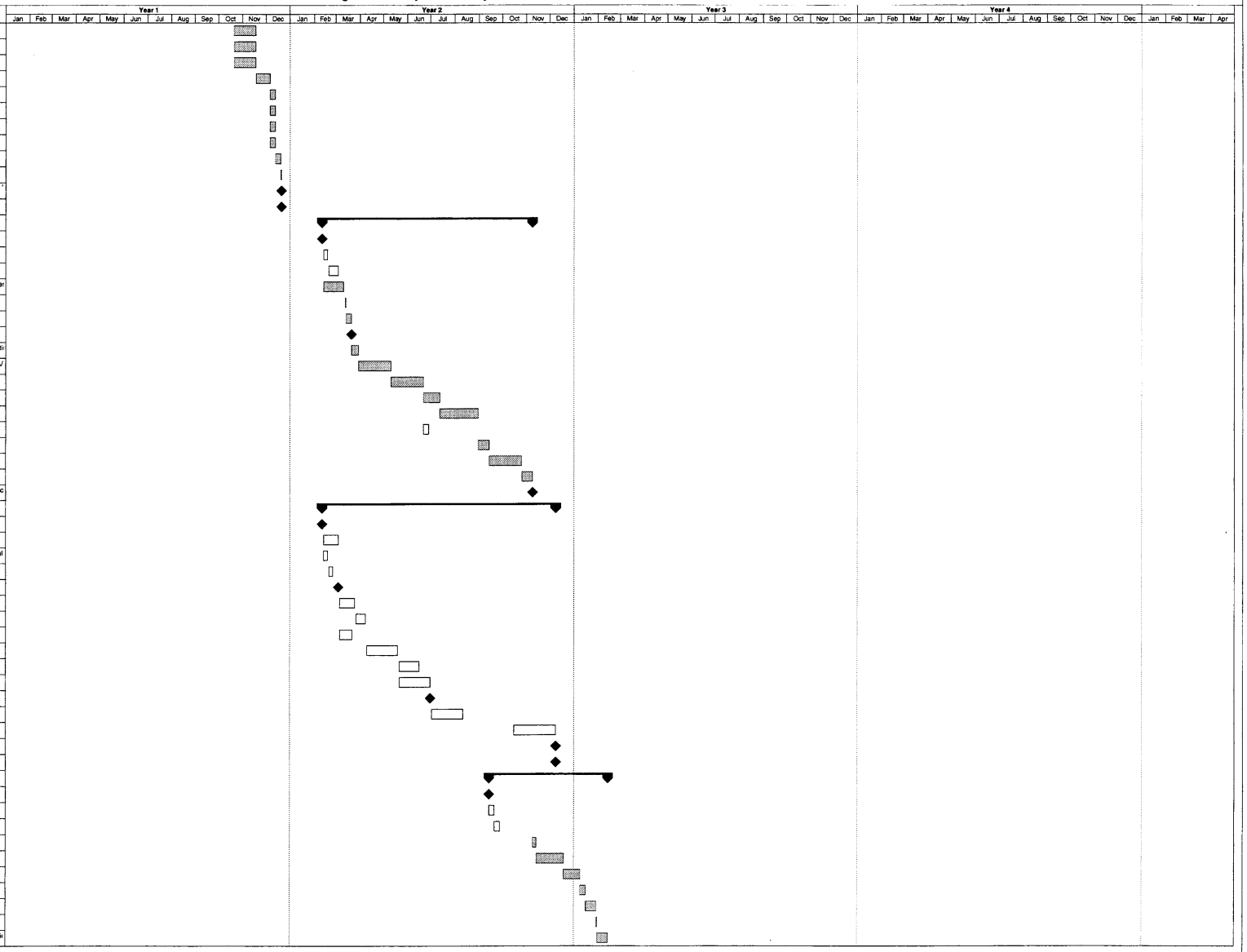


Project:

Non-critical Task | Critical Task | Milestone | Summary

NAFMC Design-Build Project Delivery Process - GANTT Chart

ID	Task Name	Responsible	Description
59	PVA21	Install/MACOM	Reviews draft report & provides comments to PGM
60	PVA22	CFSC-RM	Reviews ROI template & provides comments to PGM
61	PVA23	CFSC-CO	PJM reviews draft report & comments to PGM
62	PVA24	PVAC	Prepares final report and forwards to PGM
63	PVA25	Proponent	Reviews final PVA report & comments to PVAC
64	PVA26	CFSC-RM	Reviews final report & comments to PVAC
65	PVA27	CFSC-CO	Reviews final report & comments to PVAC
66	PVA28	Install/MACOM	Reviews final report & comments to PVAC
67	PVA29	PVAC	Makes final changes & issues to PGM
68	PVA30	Proponent	Sends final PVA report to users
69	PVA Report		PVA Report complete
70	END PVA		End of the PVA process
71	**RFP Development Phase**		
72	Begin RFPDev		Begin the RFP Development phase
73	RFP Dev1	CFSC-CO	Seeks design start approval from ASAs
74	RFP Dev2	ASA(IL&E)	Provides selective design start approvals
75	RFP Dev3	CFSC-CO	Develops project mgt plans w/ attachments & enclosures
76	RFP Dev4	CFSC-CO	Sends acquisition plans to CFSC-NC
77	RFP Dev5	CFSC-NC	Selects and notifies most qualified A/E firms
78	A/E Selected		A/E firm is selected
79	RFP Dev6	CFSC-NC	Schedule & hold prenegotiation RFP development meeti
80	RFP Dev7	CFSC-NC	Negotiates and awards RFP development contract to A/
81	RFP Dev9	A/E	Develops RFP and attachments draft
82	RFP Dev10	Proponents	Review/approve draft RFP & comment
83	RFP Dev12	A/E	Develops final RFP & submits to CFSC
84	RFP Dev11	CFSC-CO	Review/approve draft RFP & comment
85	RFP Dev13	CFSC-CO	Performs final review & approval of RFP
86	RFD Dev14	CFSC-NC	Finalizes RFP
87	RFD Dev15	CFSC-NC	Reproduces RFP Package
88	End RFP DEV		RFP done / concepts + functions + description + specific
89	**Program Review/Approval Phase**		
90	Begin PrgRev		Begin the program review and approval process
91	Prog Rev1	CFSC-CO	Reviews & updates DD1391s project submissions
92	Prog Rev2	EXCOM	Reviews & recommends NAF program funding approval
93	Prog Rev3	BoD	Reviews & approves NAF program funding
94	Funds Approval		NAFMC funding approved & TOA established
95	Prog Rev4	USACE	Tech review & verifies DD1391 project estimate
96	Prog Rev5	CRRC Subcom	Reviews & approves project submissions
97	Prog Dev10a	CFSC-CO	Consolidates/validates DD1391 submissions
98	Prog Rev7	USACE	Prepares NAF project 'Greenbook'
99	Prog Rev8	ASA(MR&A)	Reviews/approves project submissions (greenbook)
100	Prog Rev9	ASA(IL&E)	Reviews/ approves project submission (greenbook)
101	Greenbook		Greenbook finalized and ready for approval
102	Prog Rev10	OASD(PSF&E)	Reviews, approves, & consolidates NAF program
103	Prog Rev11	HASC	Subpanel reviews/ approves selective NAF program
104	Program Release		NAFMC program released for execution
105	End ProgRev		End of Program review phase
106	**Contractor Acquisition Phase**		
107	Begin Acquisition		Begin D/B contractor acquisition process
108	Acquis1	CFSC-CO	Requests RM perform construction fund cert
109	Acquis2	CFSC-RM	Certifies adequate funds are available
110	Acquis3	CFSC-NC	Advertises for D/B contractors
111	Acquis4	D/B Contr.	Responds to proposal requests
112	Acquis5	CFSC-NC	Evaluates proposals
113	Acquis6	CFSC-NC	Gets D/Bs to submits BAFCs if necessary
114	Acquis7	CFSC-NC	Selects most qualified D/B contractor
115	Acquis8	CFSC-NC	Awards construction contract to GC
116	Acquis9	CFSC-NC	Issues NTP to D/B contractor, prepares BCM, and verifi

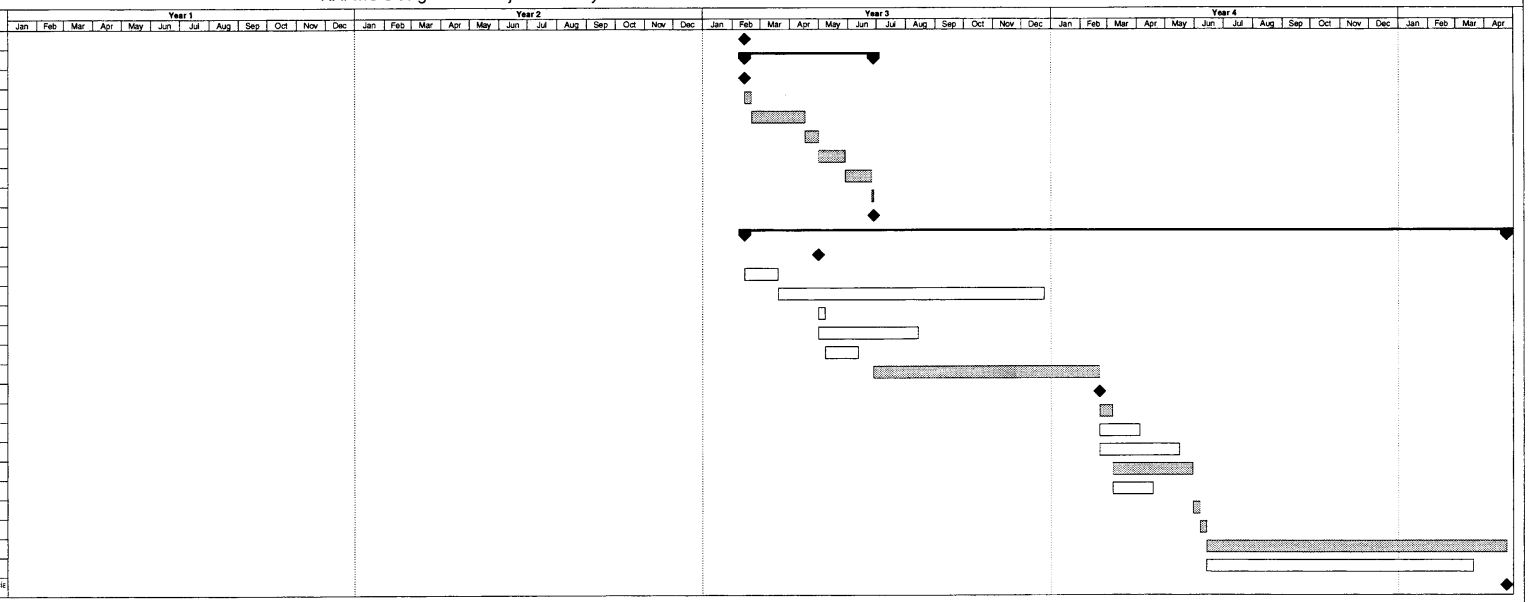


Project:
Date: Nov 14 '94

Non-critical Task Critical Task Milestone Summary

NAFMC Design-Build Project Delivery Process - GANTT Chart

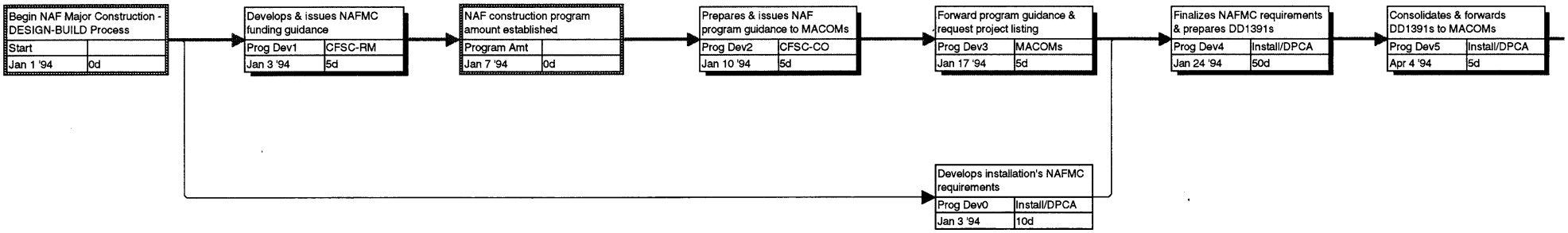
ID	Task Name	Responsible	Description
117	End Acquis		End of D/B acquisition process
118	**Project Design Phase**		
119	Begin Design		Begin facility design phase
120	Design0	CFSC-NC	Schedules and convenes predesign conference
121	Design1	D/B Contrctr	Completes 50% design with 100% site & foundation
122	Design2	CFSC-CO	Reviews plans and provides concurrence
123	Design3	D/B Contrctr	Finalizes design/provides continuing support
124	Design4	CFSC-CO	Reviews and provides final concurrence with plans
125	Design5	CFSC-NC	Issues NTP for 100% construction
126	End Design		End of D/B design phase
127	**Construction & Closeout Phase**		
128	Begin Constr		Begin construction phase
129	Construct14	CFSC-NC	Assigns title II services to USACE Distr or other
130	Construct15	USACE/Other	Provides on-going construction/quality mgt.
131	Construct1	CFSC-CO	Issues limited NTP for site & foundation work
132	Construct2	D/B Contrctr	Mobilizes to job site
133	Construct3	D/B Contrctr	Begins construction - site work and foundation
134	Construct5	D/B Contrctr	Finalizes facility construction
135	Facility Complete		Facility is substantially complete
136	Construct6	CFSC-CO	Performs prefinal inspection & punch list
137	Construct11	D/B Contrctr	Final demobilization from the job site
138	Construct12	CFSC-CO	Responds to final modifications & claims
139	Construct7	D/B Contrctr	Corrects punchlist deficiencies
140	Construct10	User	Occupies the facility
141	Construct8	CFSC-CO	Performs final inspection & facility acceptance
142	Construct9	CFSC-CO	Accepts facility
143	Construct 16	User	Monitors facility warrantees and guarantees
144	Construct13	USACE Dist.	Performs financial & contract close-out
145	End		NAF Major Construction Process Complete and Financia



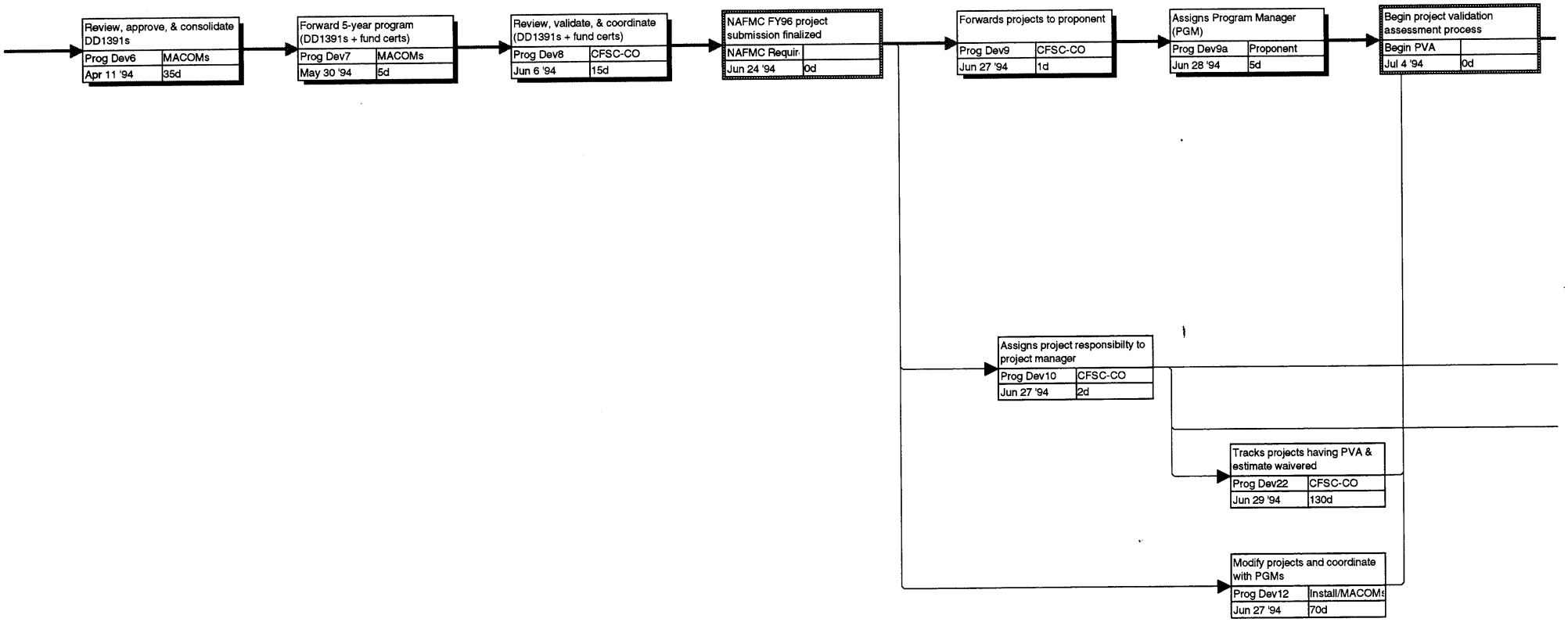
Project:
Date: Nov 14 '94

Non-critical Task | Critical Task | Milestone | Summary

NAFMC Design-Build Project Delivery Process



NAFMC Design-Build Project Delivery Process



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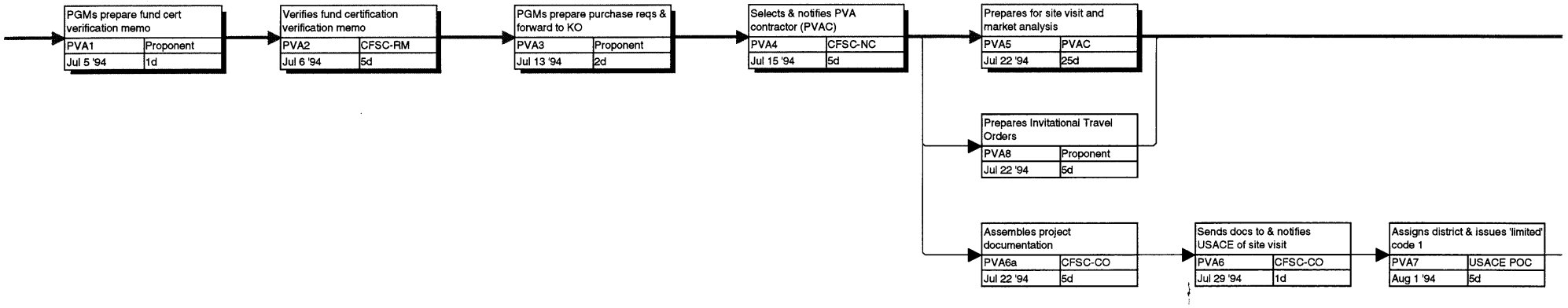

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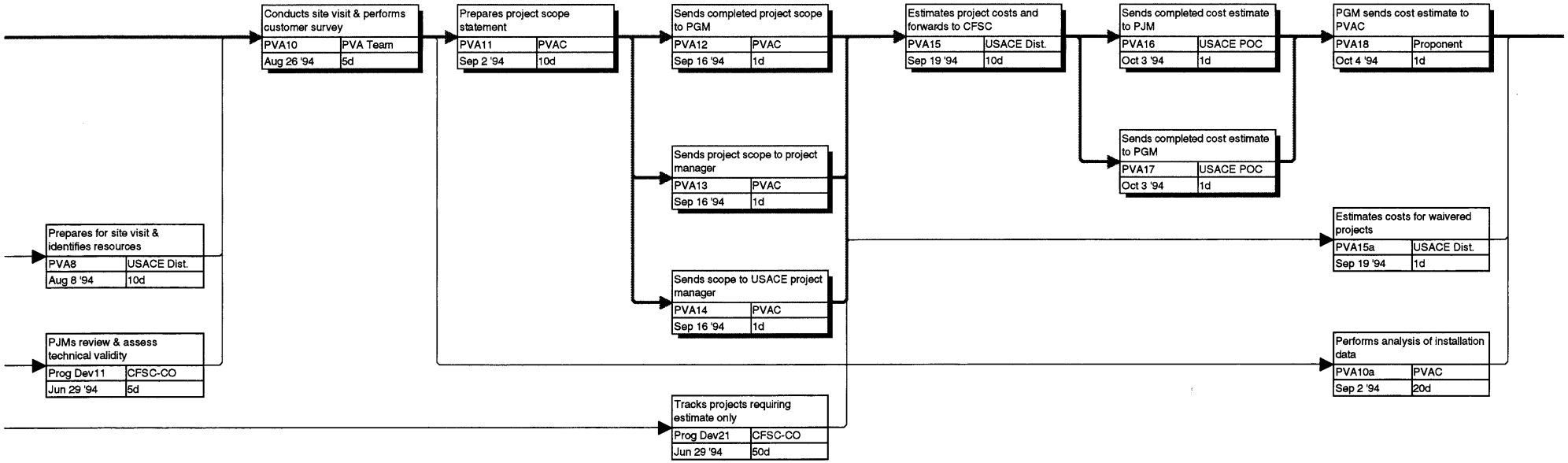

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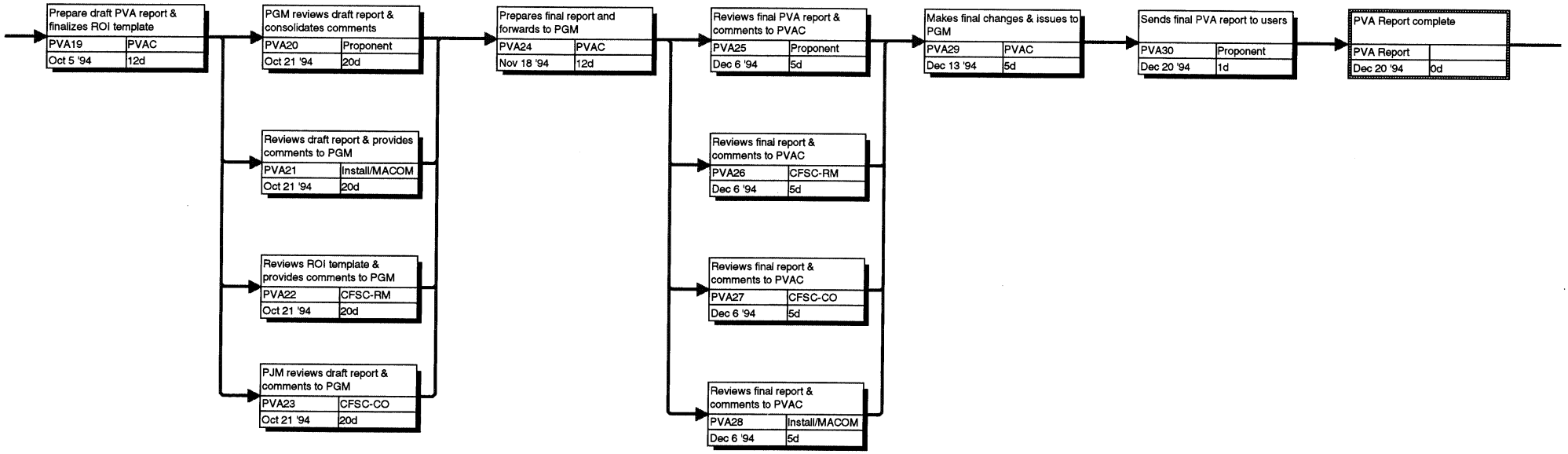

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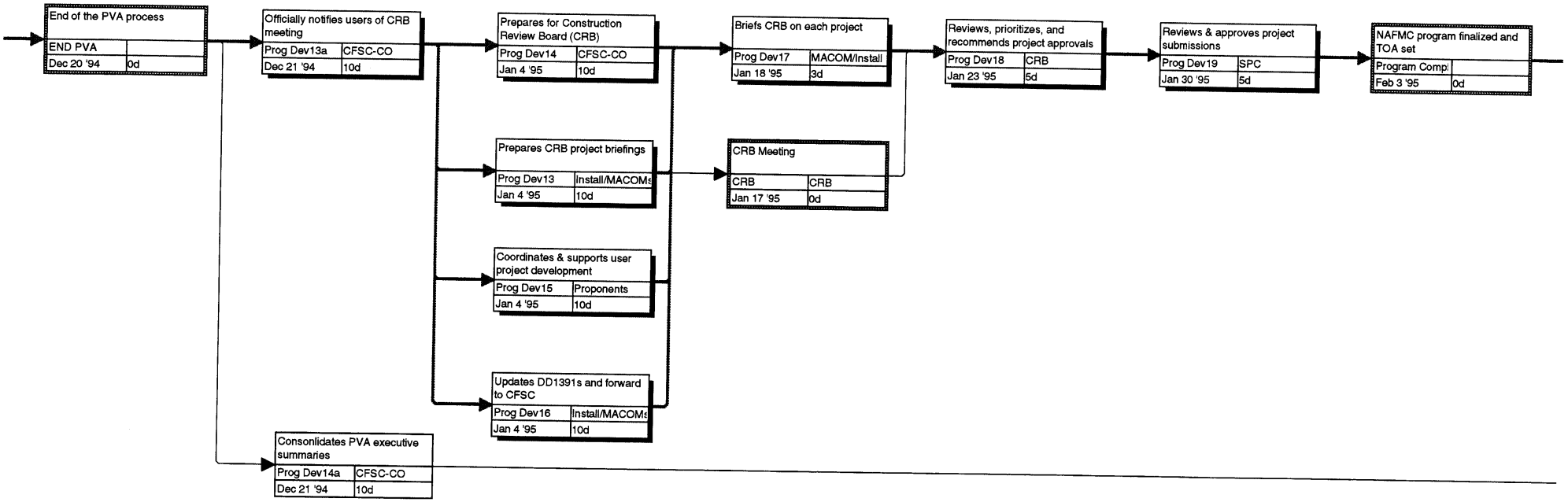

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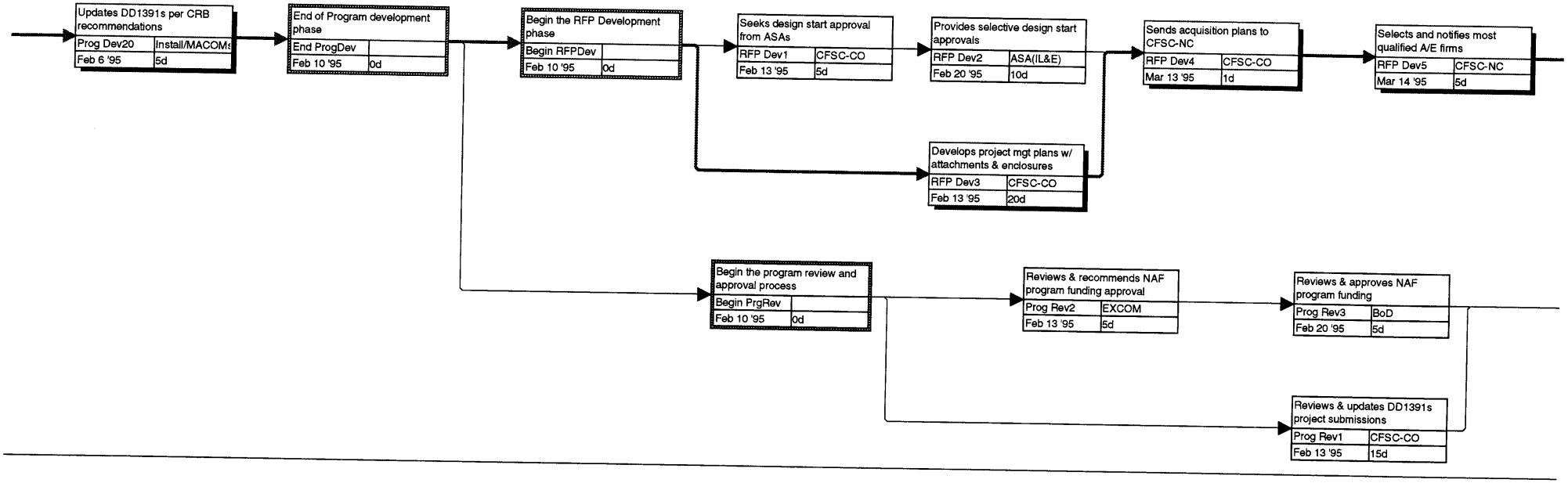

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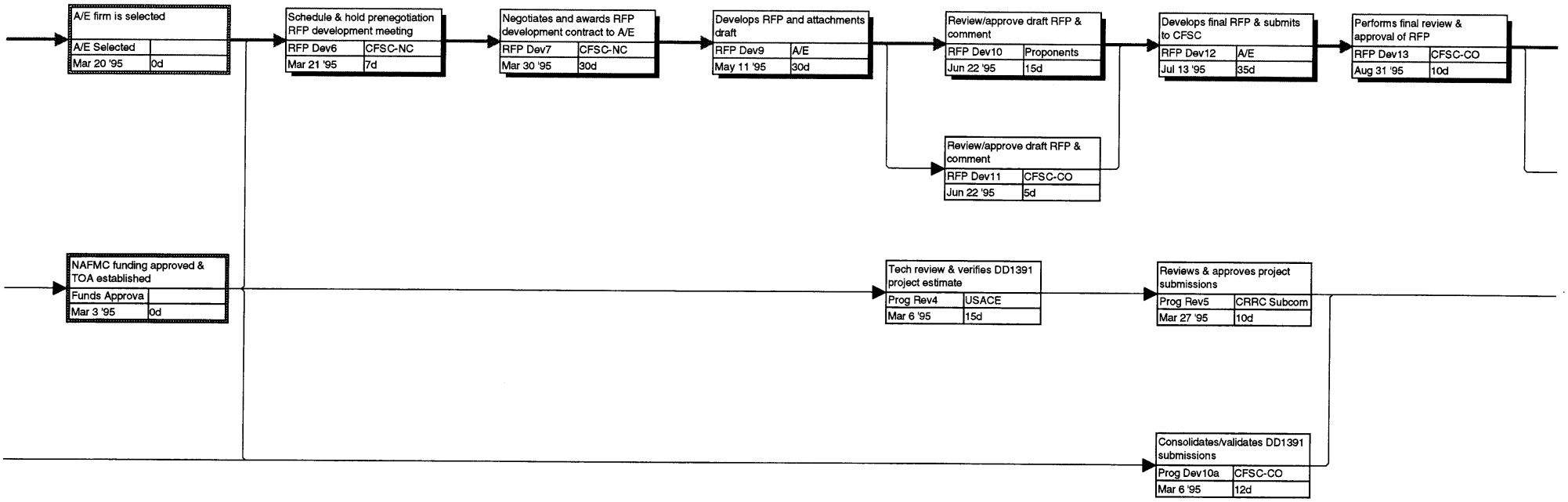

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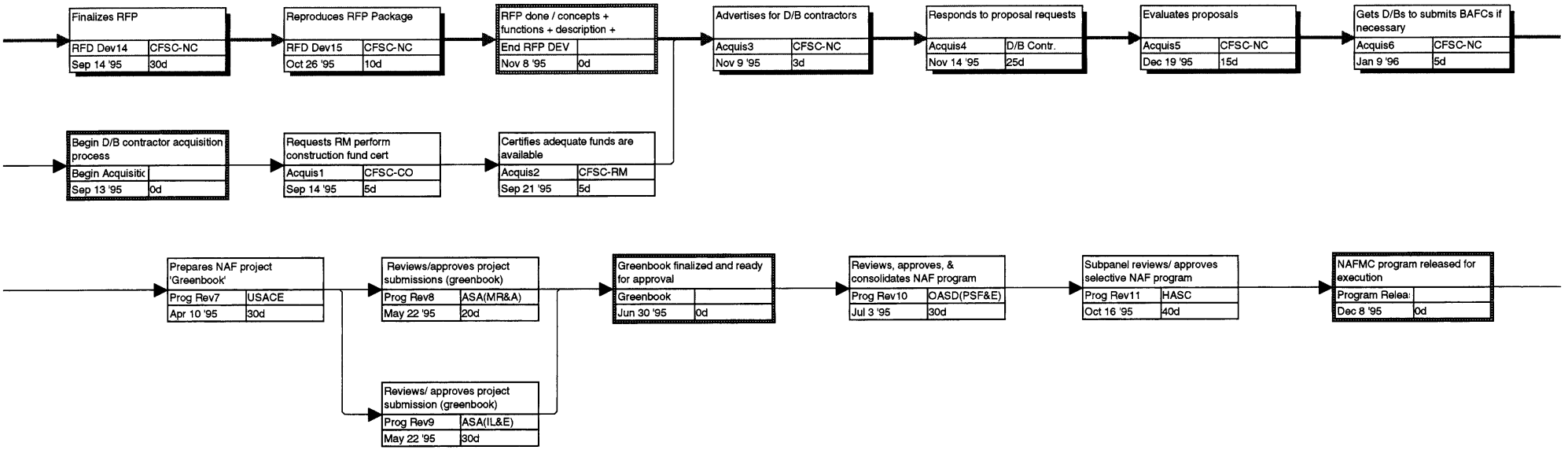

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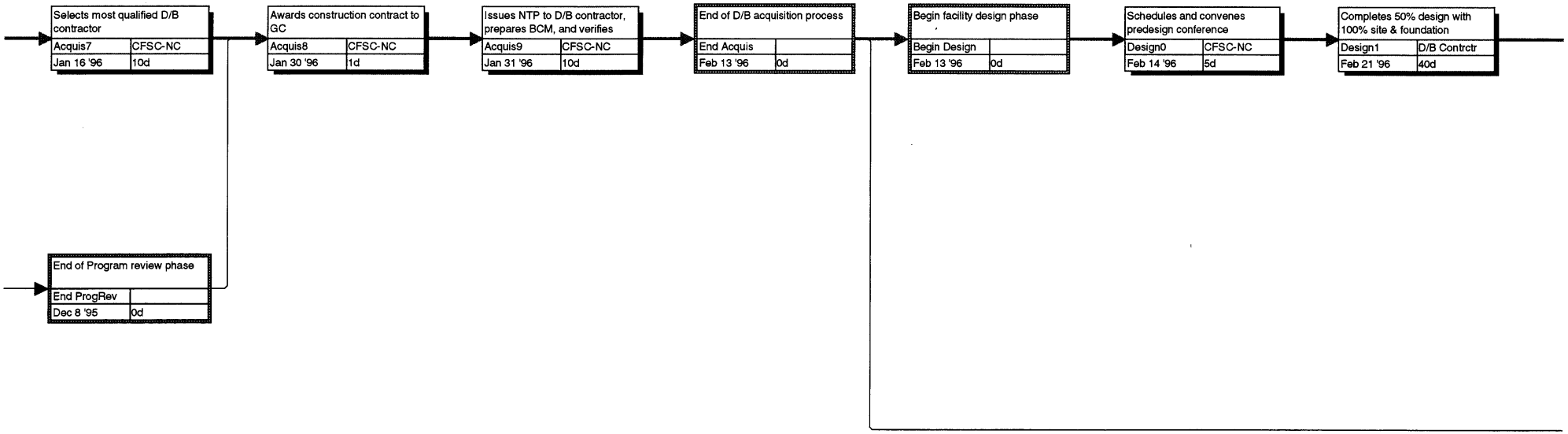

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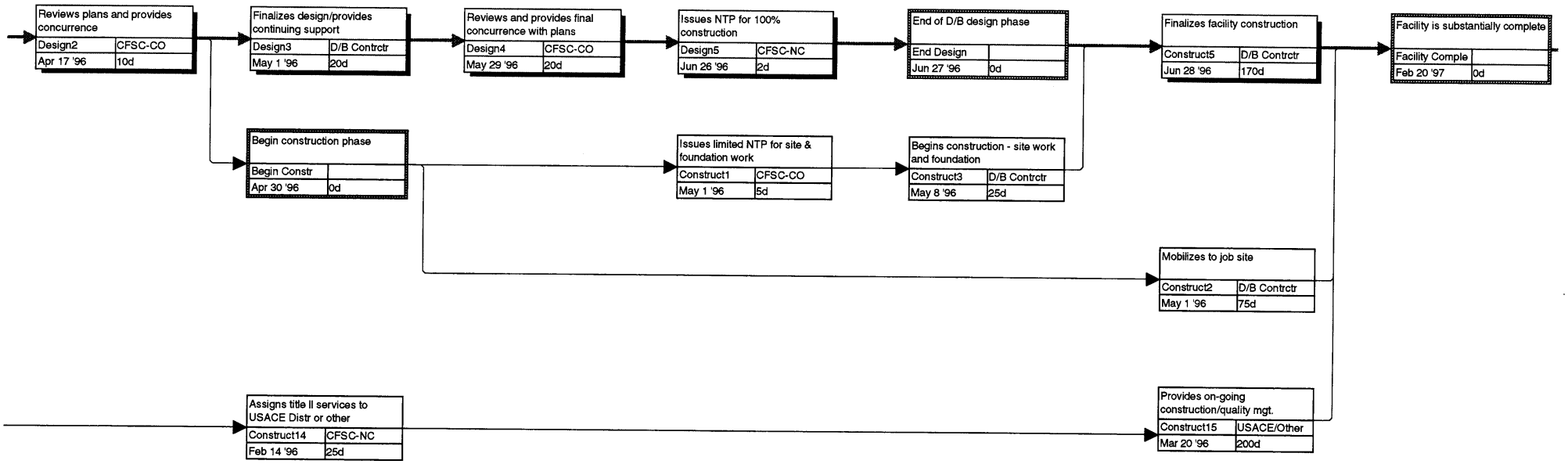

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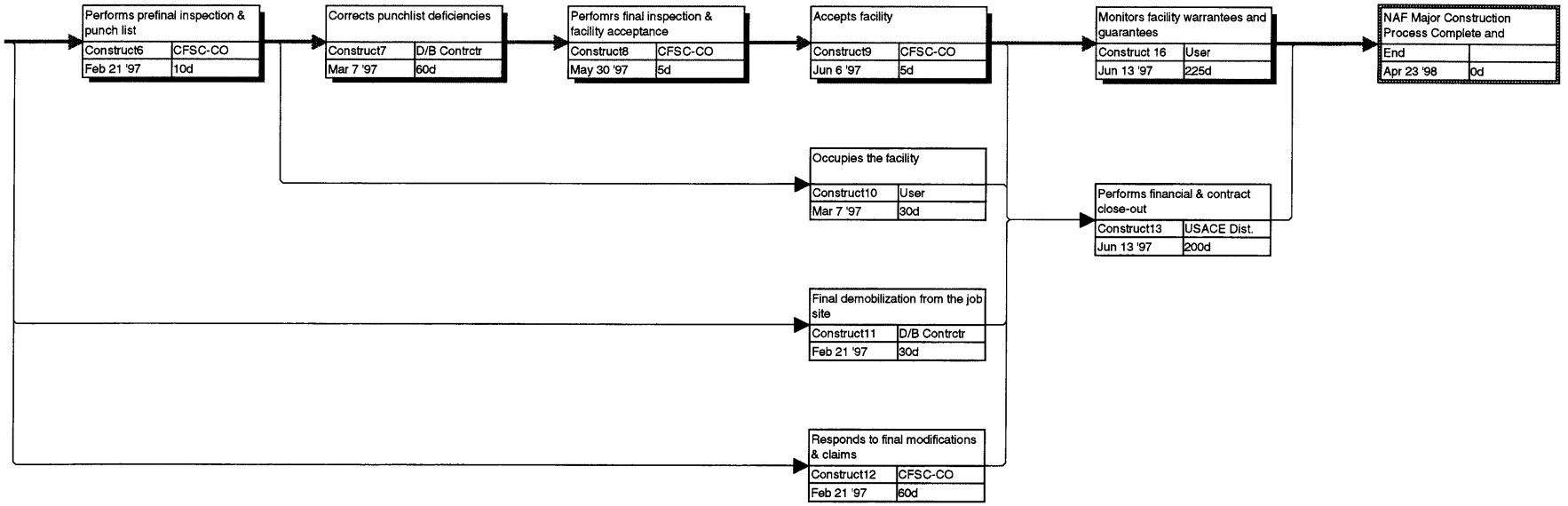

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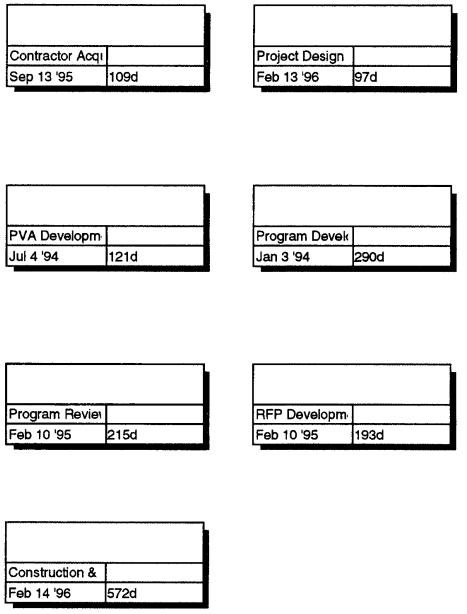
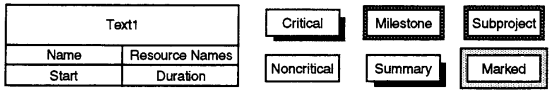


NAFMC Design-Build Project Delivery Process

roject:
Date: Aug 23 '94



APPENDIX E

"To Be" IDEF Activity of Model NAFMC Process

"To Be" IDEF Activity Model of NAFMC Process

The process improvements recommended in this study, if implemented, would result in a number of modifications to the activities performed in the current nonappropriated funds major construction (NAFMC) program. Some activities would be eliminated completely. The new set of activities that would be performed as part of the future NAFMC program will result in the activity node tree depicted below. This node tree represents the NAFMC "to be" IDEF model. Strikethroughs indicate nodes that have been deleted. Bold and italicized nodes are activities that are new or have been significantly modified.

[A0] Deliver NAFMC projects

[A1] Identify Project Requirements

[A11] Perform Triennial Needs Assessment

[A111] Identify consumer needs

[A112] Perform Local Market Analysis

[A113] Assess Existing Facility Analysis

[A114] Perform Resource Analysis

[A115] Evaluate Alternatives

[A12] Develop 3-~~5~~-year NAFMC Plan

[A13] Develop DD1391 Front Page

[A131] ***Evaluate Out-of-cycle Submissions***

[A132~~1~~] Develop Preliminary Scope

[A133~~2~~] Develop Preliminary Cost Est.

[A134~~3~~] Locate Facility Site

[A135~~4~~] Develop Narrative Justification

[A136~~5~~] Prepare Automated Form

[A14] ***Develop & Issue Program Guidance***

[A15] Update CAPCES Database

[A2] Perform Project Validation Assessment

[A21] Acquire PVA Contractor

[A211] ***Develop SOW & Create Eval. Plan***

[A212] Prepare Cost Est. for PVA

[A213] ***Certify Funds***

[A214] Solicit & Evaluate Proposals

[A215] Award IDQ Contracts or Install Contracts

[A216] Issue Project-Specific Delivery Orders

[A22] Perform "Limited" Code 1 Directive

[A221] Issue Directive

[A222] ***Certify Funds***

[A223] Conduct Site Evaluation

[A224] Estimate Project Costs

[A23] Conduct PVA & Market Analysis

[A231] Conduct Existing Facility Analysis

[A232] Analyze Market Demand

[A233] Perform Financial Analysis

[A234] Analyze Site & Surrounding Area

[A234] Develop Project Scope

[A235] Develop Viable Alternatives

[A24] Prepare PVA Report

[A241] Prepare Draft Report

[A242] Coordinate & Review Draft Report

[A243] Finalize Report

[A25] Finalize DD 1391

[A251] Confirm Project Scope

[A252] Confirm Costs

[A253] Confirm Siting

[A254] Complete DD1391

[A255] Approve & Submit

[A3] Review & Approve NAFMC Projects

[A31] ***Perform MACOM-Level Review & Approval***

[A32] Conduct Army CRB

[A321] ***Generate CRB Letter of Instruction***

[A322] Develop Project Briefings

[A323] Prepare CRB Read Ahead

[A324] ***Conduct CRB Meeting***

[A325] Prepare CRB Meeting Minutes

[A326] Revise DD1391s

~~[A33] Perform CRRC Review~~

~~[A34] Perform Tech Review~~

[A335] Obtain Higher-Echelon Approval

[A3351] Obtain ExCom Approval

~~[A352] Obtain BoD Approval~~

[A33253] Obtain OASA Approval

[A33354] Obtain OSD Approval

[A33455] Obtain HASC Approval

[A346] ***Prepare "Greenbook"***

[A3461] Edit Final DD1391s

[A3462] Update CAPCES

[A3463] Consolidate All Army NAF Projects

[A3464] Generate Draft "Greenbook" Report

[A3465] Review Draft Report

[A3466] Produce Final Report

[A4] Manage Project Execution

[A41] Manage Design-Bid-Construct

[A411] Acquire A-E Firm

[A412] Design Facility

[A413] Acquire Construction Contractor

[A414] Construct Facility

[A42] Manage Design-Build

[A421] Develop RFP

[A422] Acquire D/B Contractor

[A423] Execute D/B Contract

[A43] ***Manage Project Finances***

[A431] ***Certify Funds***

[A432] ***Account For Project Funds***

[A433] Prepare AMWRF Cash Flow

[A434] ***Closeout Project Finances***

[A5] Perform Postoccupancy Assessment

[A51] Perform Financial Analysis

[A52] Perform Program Analysis

[A53] Perform Cost Analysis

[A54] Prepare Briefing to CRB and Finance Committee

Many of the changes implied by the recommendations of this study are not so much radical revisions of the existing system as they are refinements to the existing system. As such, much of the process depicted in the "as is" IDEF model is applicable in the "to be" model. For the purposes of this appendix, we chose not to duplicate pages from the "as is" IDEF model that did not change markedly. For those, refer to Appendix B. Where changes were significant, however, we have provided a depiction of the new system in the pages that follow.

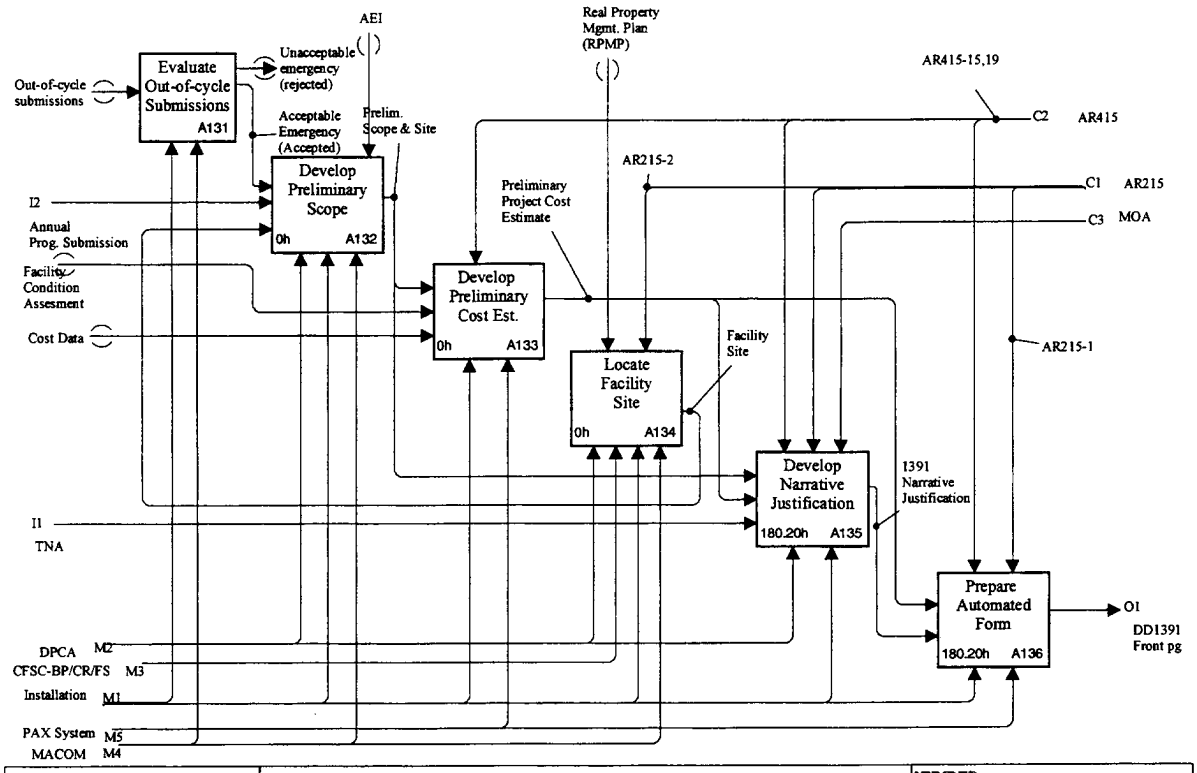
Table E-1 summarizes the changes to the appropriate activity nodes that would result once the recommendations of this study have been implemented. LMI, in conjunction with the CFSC process action team, recommends the elimination or modification of some controls and mechanisms in the NAFMC delivery process because they are either redundant or unnecessary to meeting CFSC's objectives of achieving the most cost and time-effective delivery of NAFMC projects. We also recommend the additions of [A131] "Evaluate Out-of-Cycle Submissions" to the [A13] activity node.

Table E-1.
Modifications to the NAFMC IDEF Model Resulting from Business Process Reengineering

Activity node	Action	Description
[A13] Develop DD 1391 Front Page	Add	Add [A131] Evaluate Out-of-Cycle Submissions Activity Box.
[A33] Perform CRRC Review	Eliminate	Eliminate CRRC mechanisms, and CRRC-DA Reg and AR415-19 controls.
[A34] Perform Tech Review	Eliminate	Eliminate HQ USACE mechanism, and AR415-19 and NAFMC funding authorization controls.
[A32] Conduct CRB	Modify	Add mechanism OASA(IL&E) Rep as a voting member of the CRB. Add prioritization matrix model as a mechanism.
[A35] Obtain Higher Echelon Approval	Eliminate	Eliminate [A352] Obtain BOD Approval (i.e., delegate authority to ExCom.)
[A36] Prepare Greenbook	Modify	Replace HQUSACE with CFSC.
[A43] Manage Project Finances	Modify	Add NAFMC MIS as mechanism.

Notes: CRRC = Construction Requirements Review Committee, CRB = Construction Review Board, OASA(I,L&E) = Office of the Assistant Secretary of the Army (Installations, Logistics, and Engineering, BOD = Board of Directors, USACE = U.S. Army Corps of Engineers, and CFSC = Community and Family Support Center.

USED AT:	AUTHOR LMI	DATE 6/05/94	WORKIN	READE DATE	CONTEXT:
	PROJECT DELIVER NAFMC PROJECTS	REV: 3.0	DRAF		Top
	NOTES: 1 2 3 4 5 6 7 8		RECOMMEND		
			PUBLICATI		



NODE: A13	TITLE: Develop DD1391 Front Page	NUMBER:

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	PROJECT: DELIVER NAFMC PROJECTS	REV: 3.0		DRAFT		Top
	NOTES: 1 2 3 4 5 6 7 8			RECOMMEND		
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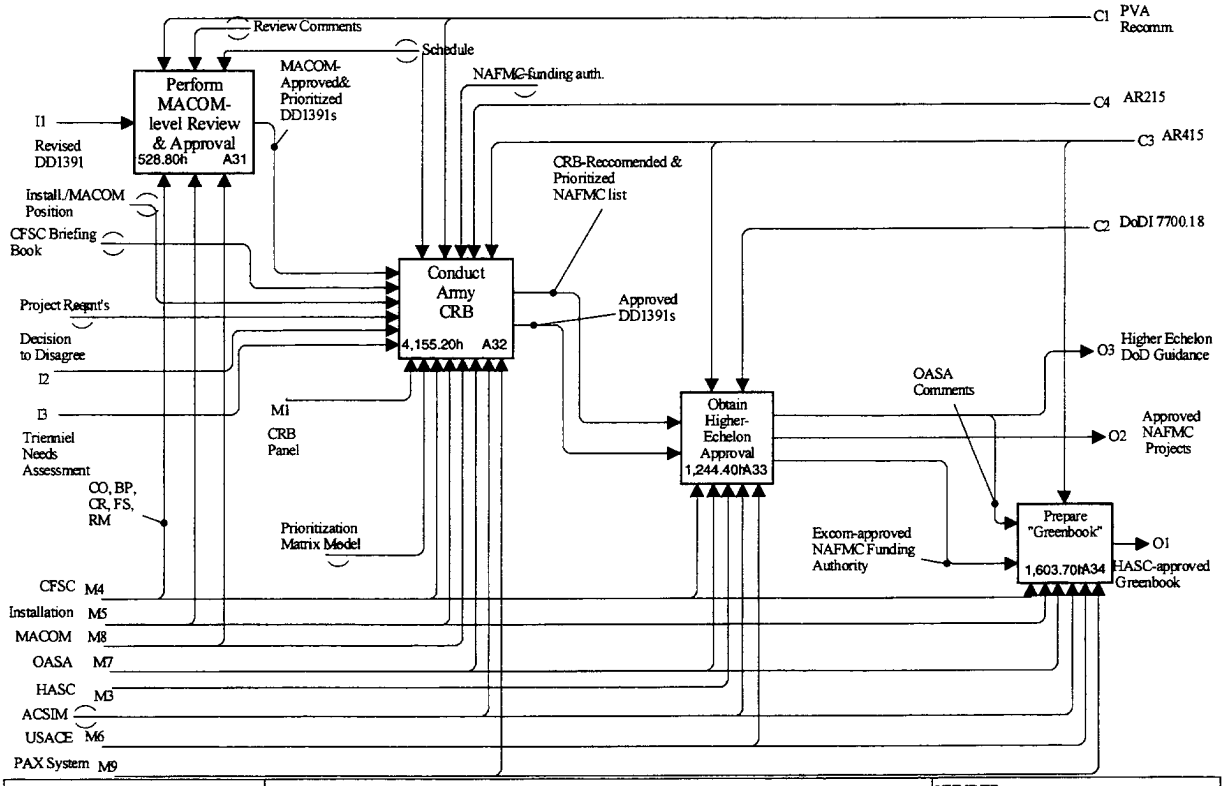
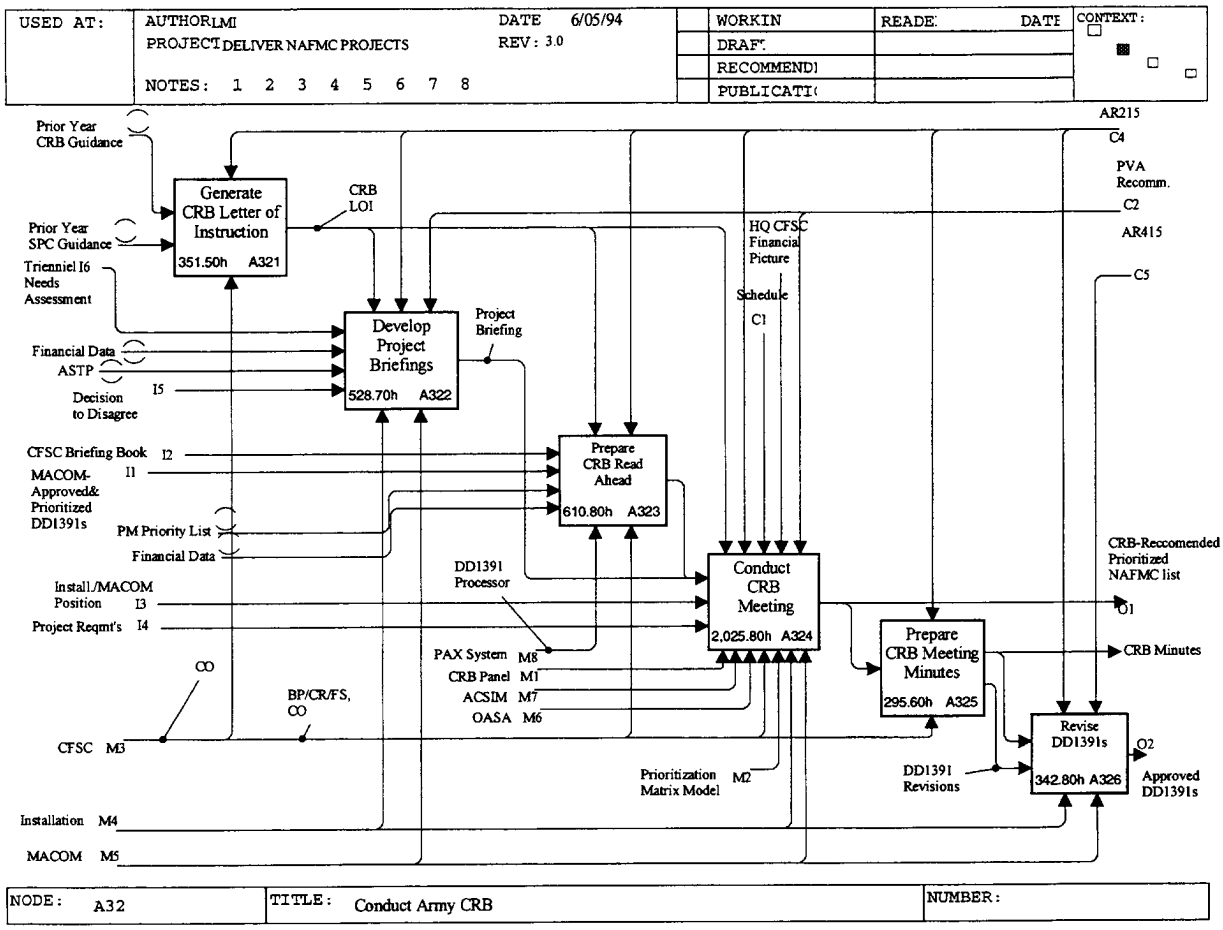


NODE: A3	TITLE: Review & Approve NAFMC Projects	NUMBER: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AUTHOR: LMI
DATE 6/05/94
PROJECT: DELIVER NAFMC PROJECTS
REV: 3.0
NOTES: 1 2 3 4 5 6 7 8
WORKIN
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RECOMMENDI
PUBLICATI(
READER
DATE
CONTEXT:
Prior Year CRB Guidance
Prior Year SPC Guidance
Trienniel I6 Needs Assessment
Financial Data
ASTP
Decision to Disagree
I5
Generate CRB Letter of Instruction
351.50h A321
CRB LOI
Develop Project Briefings
528.70h A322
Project Briefing
CFSC Briefing Book I2
MACOM-Approved& Prioritized DD1391s
I1
PM Priority List
Financial Data
Prepare CRB Read Ahead
610.80h A323
Install./MACOM Position I3
Project Reqmt's I4
DD1391 Processor
PAX System M8
CRB Panel M1
ACSIM M7
OASA M6
CO
CFSC M3
BP/CR/FS, CO
Installation M4
MACOM M5
HQ CFSC Financial Picture
Schedule
C1
Conduct CRB Meeting
2,025.80h A324
Prioritization Matrix Model M2
Prepare CRB Meeting Minutes
295.60h A325
DD1391 Revisions
Revise DD1391s
342.80h A326
AR215
C4
PVA Recomm.
C2
AR415
C5
CRB-Reccomended & Prioritized NAFMC list
O1
CRB Minutes
O2
Approved DD1391s
NODE: A32
TITLE: Conduct Army CRB
NUMBER:

USED AT:	AUTHOR: LMI	DATE 6/05/94		WORKIN	READE: DATE	CONTEXT:
	PROJECT: DELIVER NAFMC PROJECTS	REV: 3.0		DRAFT		Top
	NOTES: 1 2 3 4 5 6 7 8			RECOMMEND		
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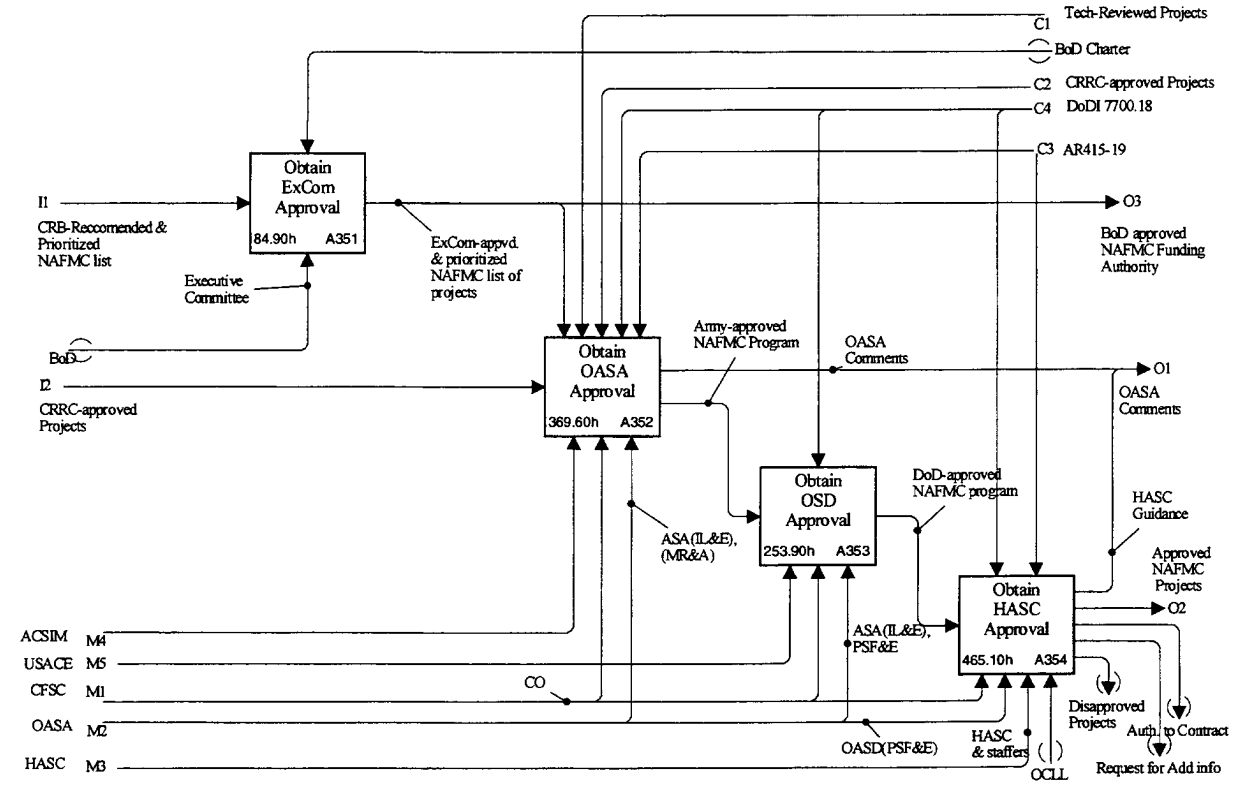

NODE: A35	TITLE: Obtain Higher- Echelon Approval	NUMBER:

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	NOTES: 1 2 3 4 5 6 7 8			RECOMMENDI			
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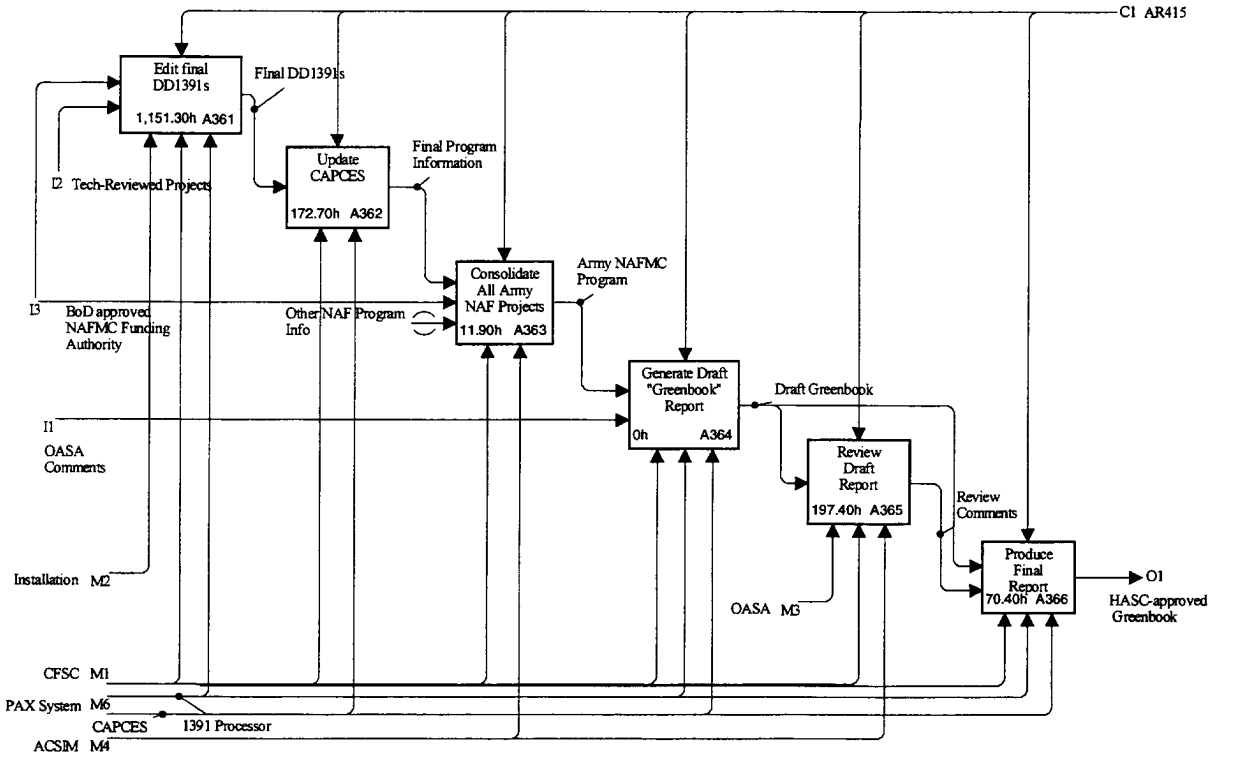

NODE: A36	TITLE: Prepare "Greenbook"	NUMBER:

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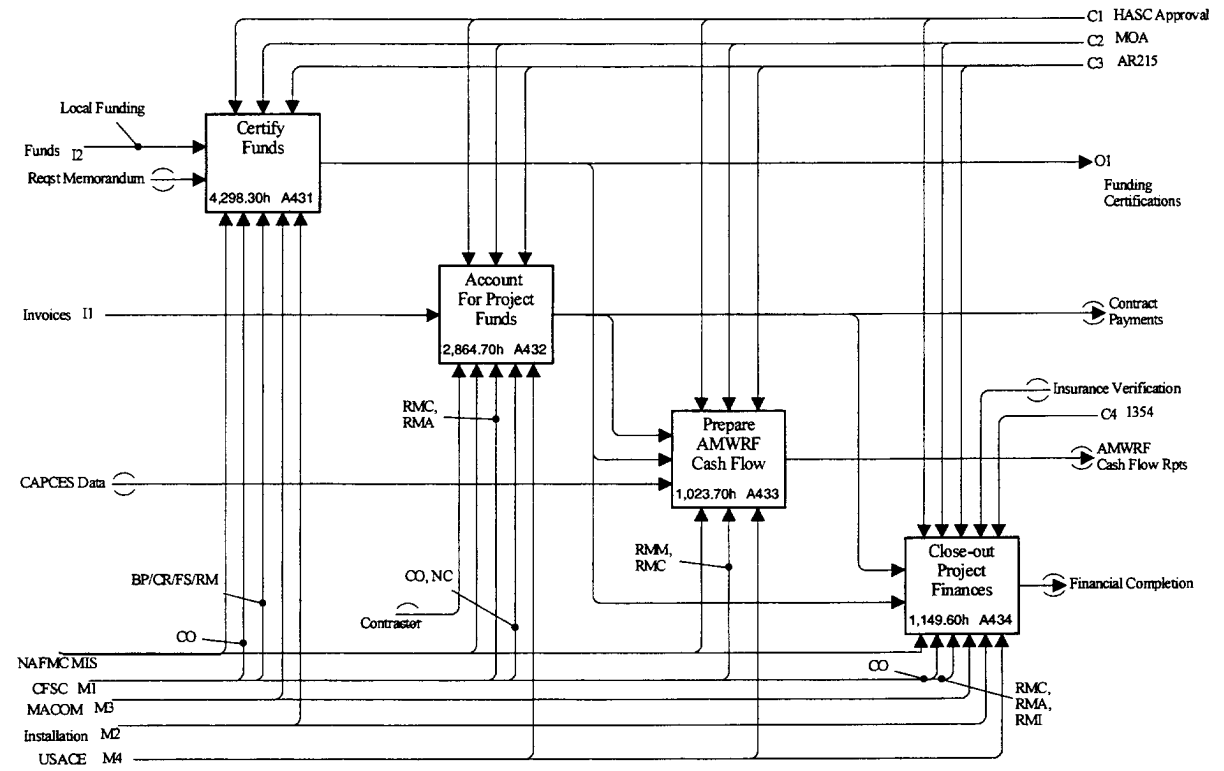
	NOTES: 1 2 3 4 5 6 7 8			RECOMMEND		
				PUBLICATI(		



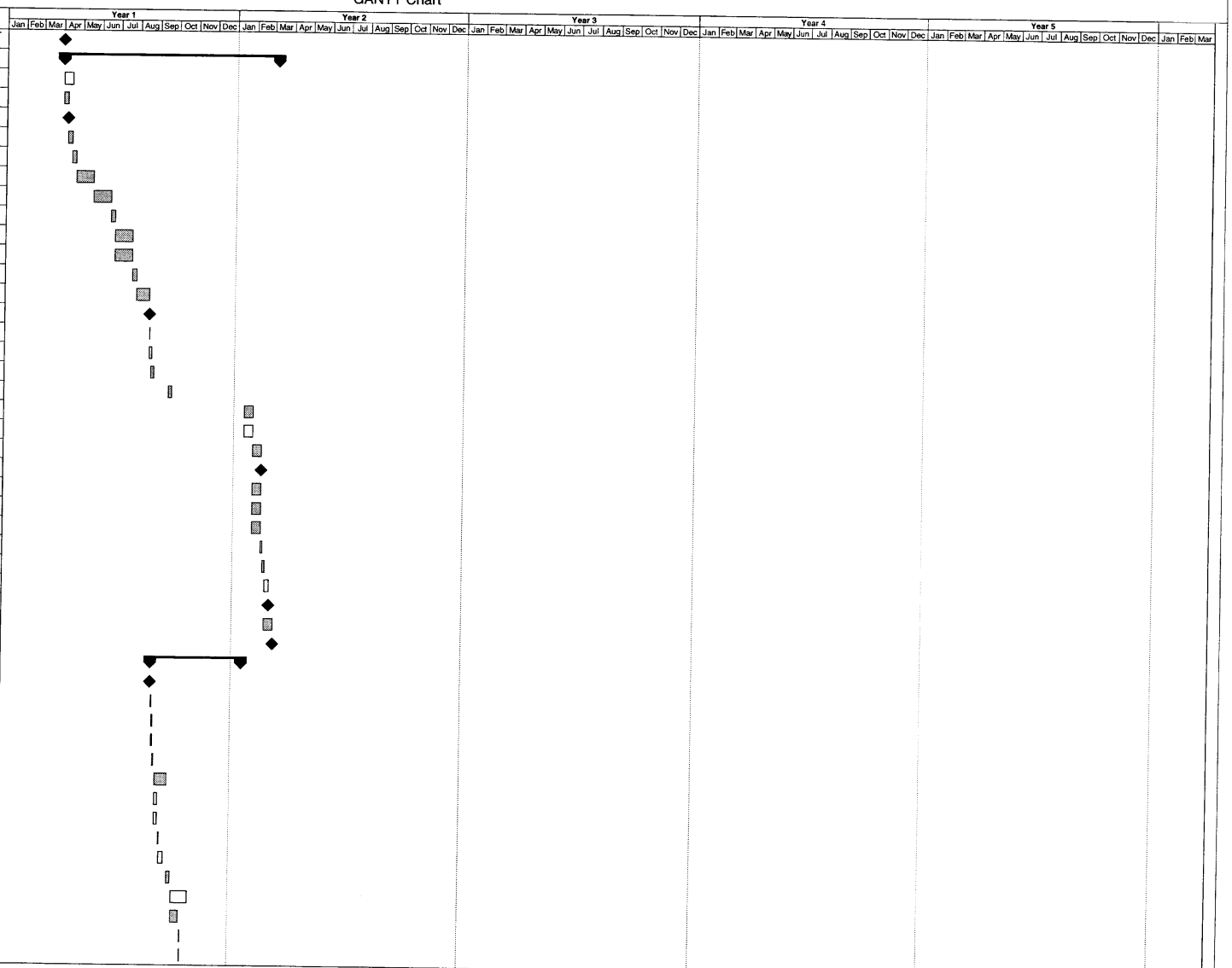
NODE: A43	TITLE: Manage Project Finances	NUMBER:

APPENDIX F

Proposed Design-Bid-Construct and Design-Build Process Time Lines and Flow Charts

Proposed NAFMC Project Delivery Process - Design-Bid-Construct
GANTT Chart

ID	Task Name	Responsible	Description
1	Start		Begin NAF Major Construction - DESIGN BID CONSTRUCT
2	**Program Development Phase**		
3	Prog Dev0	Install/DPCA	Develops installation's NAFMC requirements
4	Prog Dev1	CFSC-RM	Develops & issues NAFMC resource guidance & limits
5	Program Amt		NAFMC program amount & MACOM limits established
6	Prog Dev2	CFSC-CO	Prepares & issues NAF program guidance to MACOMs
7	Prog Dev3	MACOMs	Forward program guidance & request project listing
8	Prog Dev3A	Install/DPCA	Performs financial validation of porject opportunities
9	Prog Dev4		Finalizes NAFMC requirements & prepares DD1391s
10	Prog Dev5	Install/DPCA	Consolidates & forwards valid projects on DD1391s
11	Prog Dev6A	MACOMs	Prioritize installation projects using standard methodology
12	Prog Dev6	MACOMs	Reviews valid installation projects (DD1391s)
13	Prog Dev7	MACOMs	Forward prioritized program (DD1391s + fund certs)
14	Prog Dev8	CFSC-CO	Review, validate, & coordinate (DD1391s + fund certs)
15	NAFMC Requirements		NAFMC FY96 project submission finalized
16	Prog Dev9	CFSC-CO	Forwards projects to proponent (DD1391s + fund certs)
17	Prog Dev10	CFSC-CO	Assigns project responsibility to project manager
18	Prog Dev9a	Proponent	Assigns Program Manager (PGM)
19	Prog Dev 8A	CFSC-CO	PJMs review & assess technical validity of project
20	Prog Dev13a	CFSC-CO	Prepares & officially notifies users of CRB meeting
21	Prog Dev14a	CFSC-CO	Consolidates PVA executive summaries
22	Prog Dev13	Install/MACOI	Prepares CRB project briefings
23	Prog Dev 17a	CRB	CRB Meeting
24	Prog Dev14	CFSC-CO	Prepares for Construction Review Board (CRB)
25	Prog Dev15	Proponents	Coordinates & supports user project development
26	Prog Dev16	Install/MACOI	Updates DD1391s and forward to CFSC
27	Prog Dev17	MACOM/Insta	Briefs CRB on each project
28	Prog Dev18	CRB	Reviews, prioritizes, & recommends approvals
29	Prog Dev19	SPC	Reviews and approves project submissions
30	Program Complete		NAFMC program finalized and TOA set
31	Prog Dev20	Install/MACOI	Updates DD1391s per CRB recommendations
32	End ProgDev		End of Program development phase
33	**PVA Development Phase**		
34	Begin PVA		Begin project validation assessment process
35	PVA1	Proponent	PGMs prepare fund certification verification memo
36	PVA2	CFSC-RM	Certifies funds & returns memo to PGMs
37	PVA3	Proponent	PGMs prepare purchase reqs & forward to KO
38	PVA4	CFSC-NC	Selects & notifies PVA contractor (PVAC)
39	PVA5	PVAC	Prepares for site visit and market analysis
40	PVA7	Proponent	Prepares Invitational Travel Orders
41	PVA6a	CFSC-CO	Assembles project documentation
42	PVA6	CFSC-CO	Issues "limited" code 1 directive to USACE district
43	PVA8	USACE Dist.	Prepares for site visit & identifies resources
44	PVA10	PVA Team	Conducts site visit & performs customer survey
45	PVA10a	PVAC	Begins analysis of installation data
46	PVA11	PVAC	Prepares project scope statement
47	PVA12	PVAC	Sends completed project scope to PGM
48	PVA13	PVAC	Send project scope to project manager



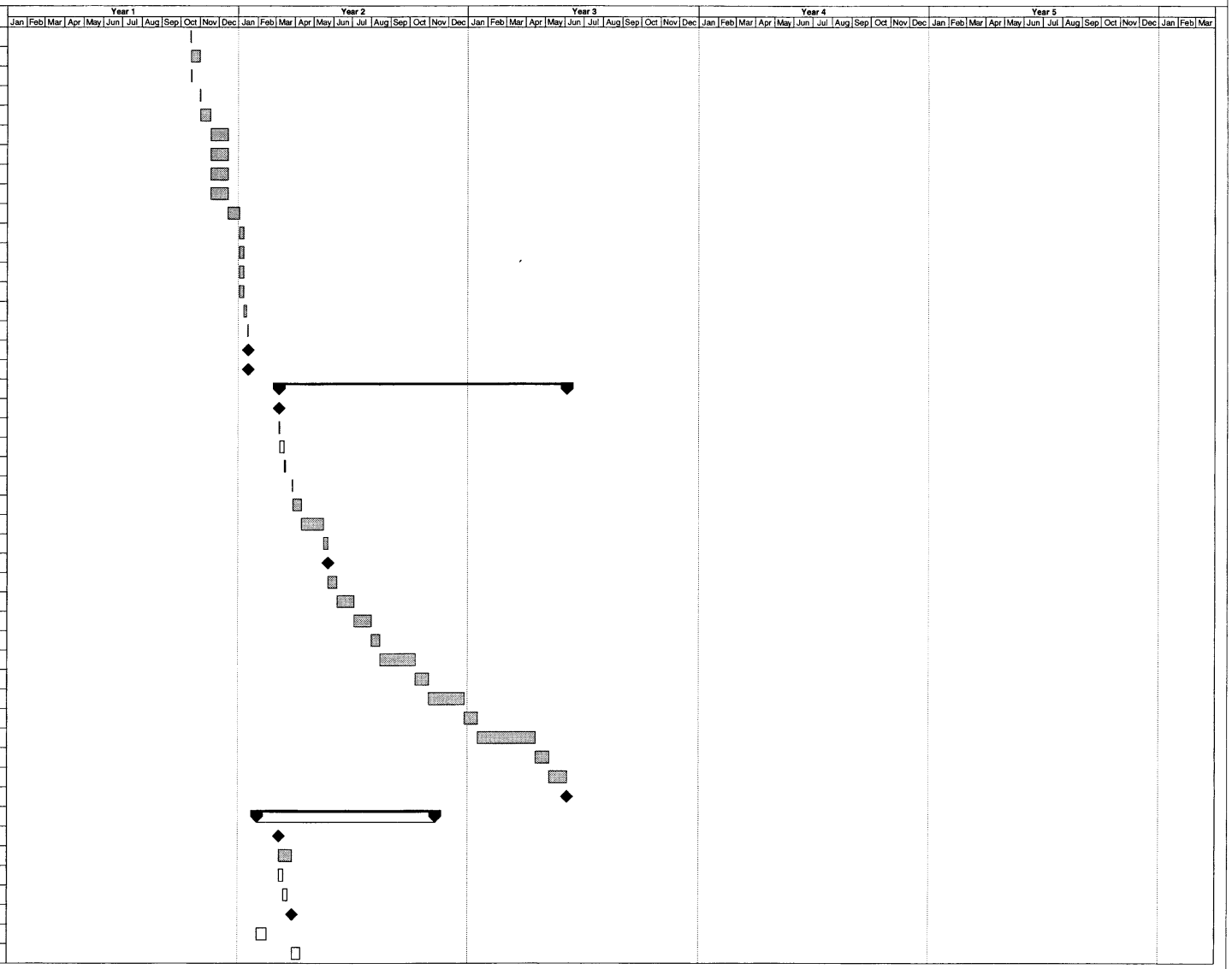
Project: NAFMC Design-Bid-Construct
Date: Nov 14 '94

Critical Task | Non-critical | Milestone | Summary

Proposed NAFMC Project Delivery Process - Design-Bid-Construct

GANTT Chart

ID	Task Name	Responsible	Description
49	PVA14	PVAC	Sends scope to USACE project manager
50	PVA15	USACE Dist.	Estimates project costs and forwards to CFSC
51	PVA15a	USACE Dist.	Estimates costs for waivered projects
52	PVA18	Proponent	PGM sends cost estimate to PVAC
53	PVA19	PVAC	Prepare draft PVA report & finalizes ROI template
54	PVA20	Proponent	PGM reviews draft report & consolidates comments
55	PVA21	Install/MACOI	Reviews draft report & provides comments to PGM
56	PVA22	CFSC-RM	Reviews ROI template & provides comments to PGM
57	PVA23	CFSC-CO	PJM reviews draft report & comments to PGM
58	PVA24	PVAC	Prepares final report and forwards to PGM
59	PVA25	Proponent	Reviews final PVA report & comments to PVAC
60	PVA26	CFSC-RM	Reviews final report & comments to PVAC
61	PVA27	CFSC-CO	Reviews final report & comments to PVAC
62	PVA28	Install/MACOI	Reviews final report & comments to PVAC
63	PVA29	PVAC	Makes final changes & issues to PGM
64	PVA30	Proponent	Sends final PVA report to users
65	PVA Report		PVA Report complete
66	END PVA		End of the PVA process
67	**Design Phase**		
68	Begin Design		Begin the A/E acquisition and design phase
69	Design0	CFSC-CO	Seeks design start approval from ASAs
70	Design00	ASA(IL&E)	Provides selective design start approvals
71	Design1	CFSC-CO	Provides USACE funding & authorizations
72	Design2	CFSC-CO	Issues code 1 directive
73	Design4	USACE Dist.	Develops criteria & prepares CBD announcements
74	Design 4A	A/E Contracto	Responds to CBD announcement
75	Design5	A/E Board	Selects most qualified A/E firm to do design
76	A/E Selected		A/E firm is selected
77	Design6	USACE Dist.	Schedules & convenes pre- negotiation conference
78	Design6a	A/E	Prepares proposal
79	Design7	USACE & A/E	Negotiates design fee
80	Design8	USACE Dist.	Awards design contract to A/E firm
81	Design9	A/E	Prepares facility design to 10% completion
82	Design10	USACE/CFSC	Reviews & approves 10% design submittal
83	Design11	A/E	Prepares facility design to 35% completion
84	Design12	USACE/CFSC	Reviews & approves 35% design submittal
85	Design13	A/E	Prepares facility design to 95% completion
86	Design14	USACE/CFSC	Reviews & approves 95% design submittal
87	Design15	A/E	Finalizes design & bid documentation
88	End Design		100% design complete & ready for advertisement
89	**Review & Approval Phase**		
90	Begin PrgRev		Begin the program review and approval process
91	Prog Rev1	CFSC-CO	Reviews & updates DD1391s project submissions
92	Prog Rev2	EXCOM	Reviews & recommends NAF program funding approval
93	Prog Rev3	BoD	Reviews & approves NAF program funding
94	Funds Approval		NAFMC funding approved & TOA established
95	Proj Rev10	CFSC-CO	Consolidates/validates DD1391 submissions
96	Prog Rev7	CFSC-CO	Prepares NAF project 'Greenbook'

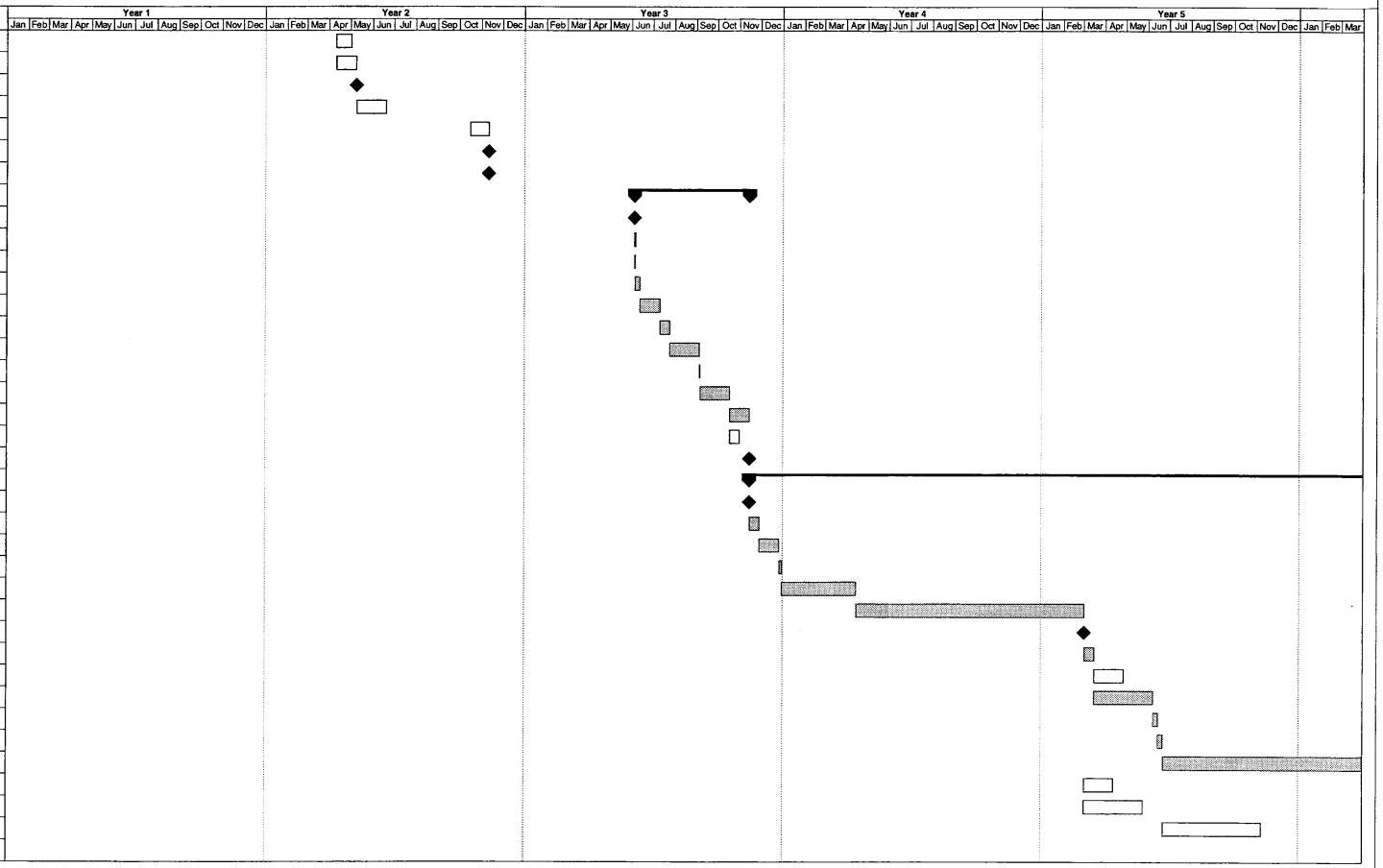


Project: NAFMC Design-Bid-Construct
Date: Nov 14 '94

Critical Task | Non-critical | Milestone | Summary

Proposed NAFMC Project Delivery Process - Design-Bid-Construct
GANTT Chart

ID	Task Name	Responsible	Description
97	Prog Rev8	ASA(MR&A)	Reviews/ approves project submissions (greenbook)
98	Prog Rev9	ASA(IL&E)	Reviews/ approves project submissions (greenbook)
99	Greenbook		Greenbook finalized and ready for approval
100	Prog Rev10	OASD(PSF&I	Review, approves, & consolidates NAF program
101	Prog Rev11	HASC	Subpanel reviews/ approves selective NAF program
102	Program Release		NAFMC program released for execution
103	End ProgRev		End of Program Review & Approval Phase
104	**Contractor Acquisition Phase**		
105	Begin GC Acq		Begin GC acquisition process
106	GC Acq1	CFSC-CO	Issues code 9 directive
107	GC Acq3	CFSC-CO	Requests RM to provide construction fund cert
108	GC Acq4	CFSC-RM	Certifies adequate funds available for project
109	GC Acq5	USACE Dist.	Issues CBD advance notice
110	GC Acq6	USACE Dist.	Prepares solicitation & copies
111	GC Acq7	USACE Dist.	Advertises for construction contractors
112	GC Acq8	GC	Responds to bid/proposal requests
113	GC Acq9	USACE Dist.	Evaluates bids &selects GC
114	GC Acq10	USACE Dist.	Awards construction contract to GC
115	GC Acq11	USACE Dist.	Finalizes project management schedule
116	End GC Acq		End of GC acquisition process
117	**Construction Phase**		
118	Begin Construction		Begin construction phase
119	Construct1	USACE Dist.	Verifies bonds, PM schedule, GC plan, etc.
120	Construct2	USACE Dist.	Schedules & convenes preconstruction conference
121	Construct3	USACE Dist.	Issues notice to proceed (NTP) with construction
122	Construct4	GC	Mobilizes to job site
123	Construct5	GC	Constructs the facility
124	Fac Complete		Facility is substantially complete
125	Construct6	USACE Dist.	Performs prefinal inspection & punch list
126	Construct10	User	Occupies the facility
127	Construct7	GC	Corrects punch list deficiencies
128	Construct8	USACE Dist.	Performs final inspection & facility acceptance
129	Construct9	USACE Dist.	Accepts Facility
130	Construct 13a	User	Monitors warranty and guarantee period
131	Construct11	GC	Final Demobilization from the job site
132	Construct12	USACE Dist.	Responds to final modifications and claims
133	Construct13	USACE Dist.	Performs financial & contract close-out
134	END		NAFMC Process Complete & Financial Closeout



Project: NAFMC Design-Bid-Construct
Date: Nov 14 '94

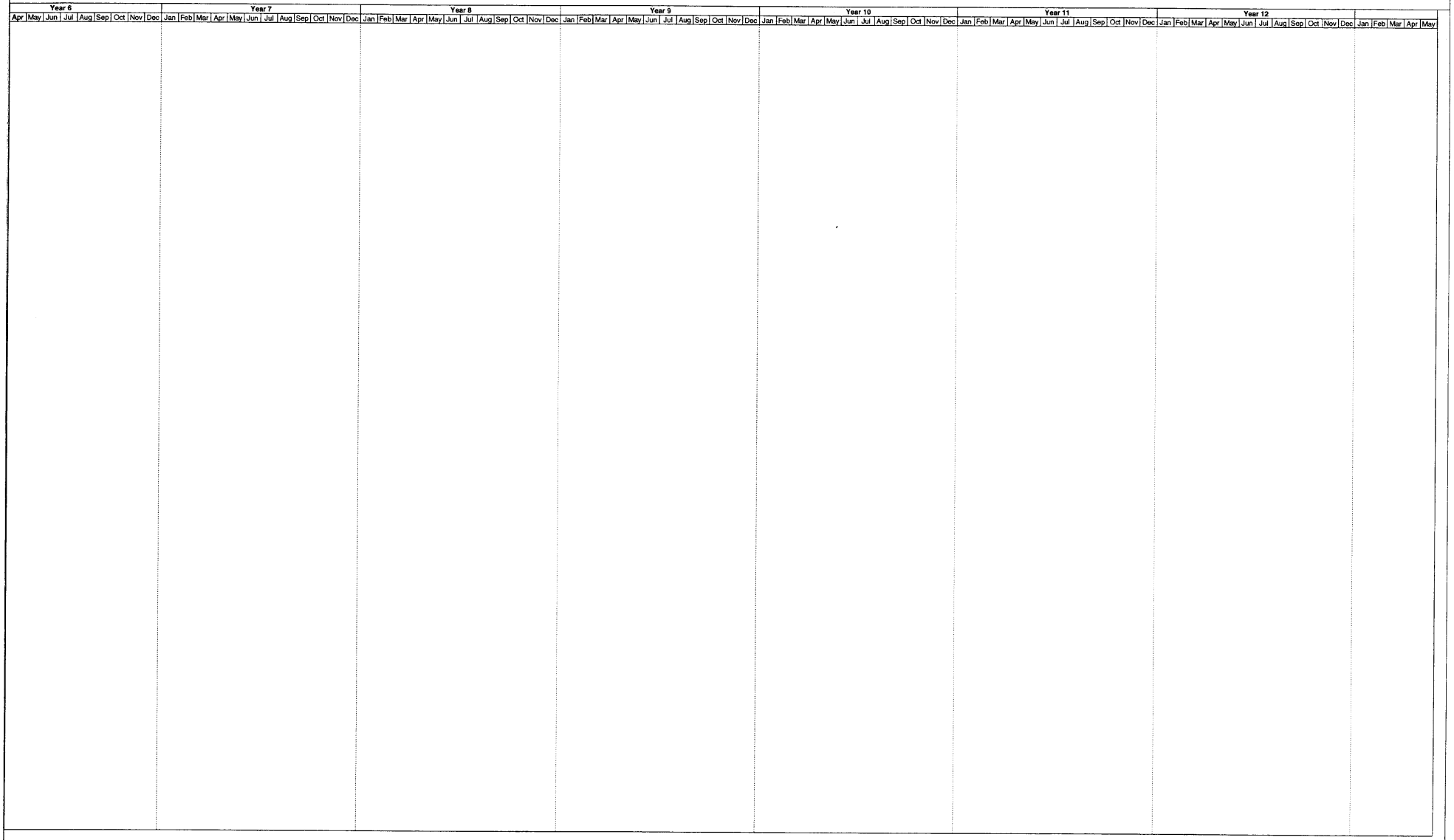
Critical Task | Non-critical | Milestone | Summary

Proposed NAFMC Project Delivery Process - Design-Bid-Construct
GANTT Chart

Project: NAFMC Design-Bid-Construct
Date: Nov 14 '94

Critical Task | Non-critical | Milestone | Summary

Proposed NAFMC Project Delivery Process - Design-Bid-Construct
GANTT Chart



Project: NAFMC Design-Bid-Construct
Date: Nov 14 '94

Critical Task | Non-critical | Milestone | Summary

Proposed NAFMC Project Delivery Process - Design-Bid-Construct

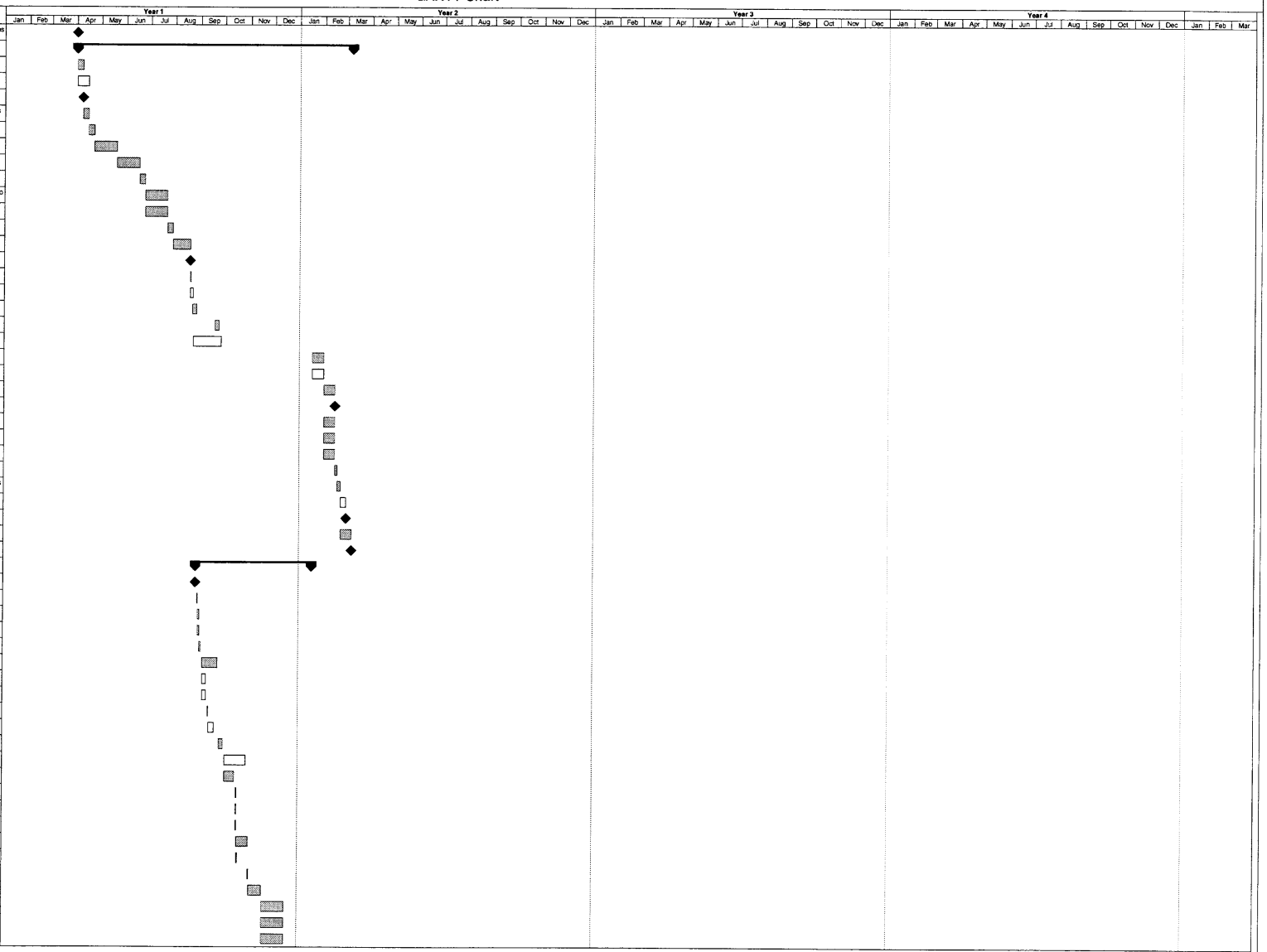
GANTT Chart

Project: NAFMC Design-Bid-Construct
Date: Nov 14 '94

Critical Task | Non-critical | Milestone | Summary

Proposed Project Delivery Process - Design-Build
GANTT Chart

ID	Task Name	Responsible	Description
1	Start		Begin NAF Major Construction - DESIGN-BUILD Proces
2	**Program Development Phase**		
3	Prog Dev1	CFSC-RM	Develops & issues NAFMC resource guidance & limits
4	Prog Dev0	Install/DPCA	Develops installation's NAFMC requirements
5	Program Amt		NAFMC program amount & MACOM limits established
6	Prog Dev2	CFSC-CO	Prepares & issues NAF program guidance to MACOMs
7	Prog Dev3	MACOMs	Forward program guidance & request project listing
8	Prog Dev3A	Install/DPCA	Performs financial validation of project opportunities
9	Prog Dev4	Install/DPCA	Finalizes NAFMC requirements & prepares DD1391s
10	Prog Dev5	Install/DPCA	Consolidates & forwards valid projects on DD1391s
11	Prog Dev6A	MACOMs	Prioritizes installation projects using standard methodolo
12	Prog Dev6	MACOMs	Review valid installation projects (DD1391s)
13	Prog Dev7	MACOMs	Forward prioritized program (DD1391s + fund certs)
14	Prog Dev8	CFSC-CO	Review, validate, & coordinate (DD1391s + fund certs)
15	NAFMC Requirements		NAFMC FY96 project submission finalized
16	Prog Dev9	CFSC-CO	Forwards projects to proponent
17	Prog Dev10	CFSC-CO	Assigns project responsibility to project manager.
18	Prog Dev9a	Proponent	Assigns Program Manager (PGM)
19	PVA 8A	CFSC-CO	PJMs review & assess technical validity of project
20	Prog Dev21	CFSC-CO	Tracks projects requiring estimate only
21	Prog Dev13a	CFSC-CO	Prepares & officially notifies users of CRB meeting
22	Prog Dev14a	CFSC-CO	Consolidates PVA executive summaries
23	Prog Dev13	Install/MACOM	Prepares CRB project briefings
24	CRB	CRB	CRB Meeting
25	Prog Dev14	CFSC-CO	Prepares for Construction Review Board (CRB)
26	Prog Dev15	Proponents	Coordinates & supports user project development
27	Prog Dev16	Install/MACOM	Updates DD1391s and forward to CFSC
28	Prog Dev17	MACOM/Install	Briefs CRB on each project
29	Prog Dev18	CRB	Reviews, prioritizes, and recommends project approvals
30	Prog Dev19	SPC	Reviews & approves project submissions
31	Program Complete		NAFMC program finalized and TOA set
32	Prog Dev20	Install/MACOM	Updates DD1391s per CRB recommendations
33	End ProgDev		End of Program Development Phase
34	**PVA Development Phase**		
35	Begin PVA		Begin project validation assessment process
36	PVA1	Proponent	PGMs prepare fund certification verification memo
37	PVA2	CFSC-RM	Certifies funds & returns memo to PGM
38	PVA3	Proponent	PGMs prepare purchase reqs & forward to CFSC-NC
39	PVA4	CFSC-NC	Selects & notifies PVA contractor (PVAC)
40	PVA5	PVAC	Prepares for site visit and market analysis
41	PVA7	Proponent	Prepares Invitational Travel Orders
42	PVA6a	CFSC-CO	Assembles project documentation
43	PVA6	CFSC-CO	Issues "limited" code 1 directive to USACE district
44	PVA8	USACE Dist.	Prepares for site visit & identifies resources
45	PVA10	PVA Team	Conducts site visit & performs customer survey
46	PVA10a	PVAC	Performs analysis of installation data
47	PVA11	PVAC	Prepares project scope statement
48	PVA12	PVAC	Sends completed project scope to PGM
49	PVA13	PVAC	Sends project scope to project manager
50	PVA14	PVAC	Sends scope to USACE project manager
51	PVA15	USACE Dist.	Estimates project costs and forwards to CFSC
52	PVA15a	USACE Dist.	Estimates costs for waivered projects
53	PVA18	Proponent	PGM sends cost estimate to PVAC
54	PVA19	PVAC	Prepare draft PVA report & finalizes ROI template
55	PVA20	Proponent	PGM reviews draft report & consolidates comments
56	PVA21	Install/MACOM	Reviews draft report & provides comments to PGM
57	PVA22	CFSC-RM	Reviews ROI template & provides comments to PGM

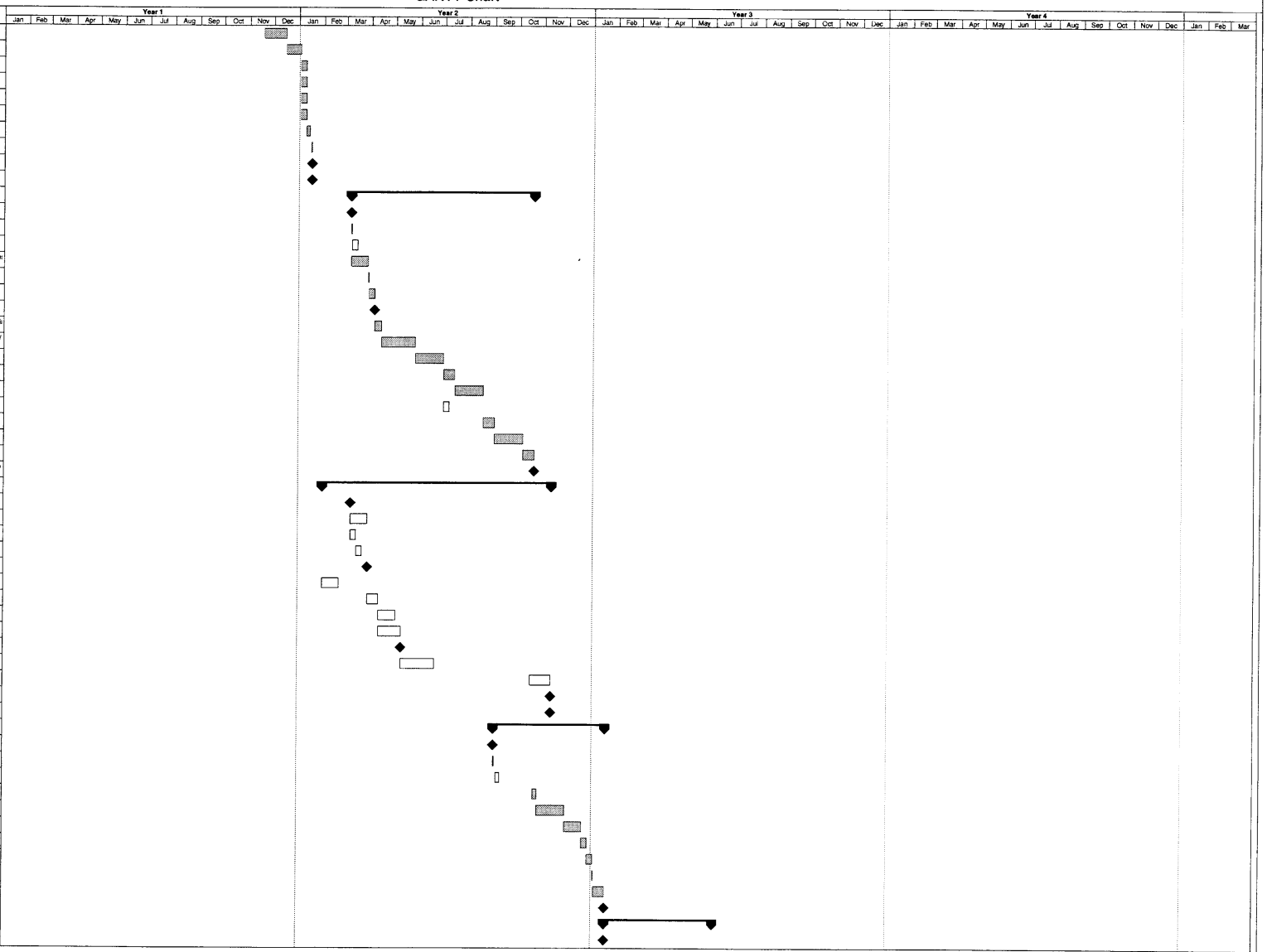


Project:
Date: Nov 14 '94

Non-critical Task | Critical Task | Milestone | Summary

Proposed Project Delivery Process - Design-Build
GANTT Chart

ID	Task Name	Responsible	Description
58	PVA23	CFSC-CO	PJM reviews draft report & comments to PGM
59	PVA24	PVAC	Prepares final report and forwards to PGM
60	PVA25	Proponent	Reviews final PVA report & comments to PVAC
61	PVA26	CFSC-RM	Reviews final report & comments to PVAC
62	PVA27	CFSC-CO	Reviews final report & comments to PVAC
63	PVA28	Install/MACOM	Reviews final report & comments to PVAC
64	PVA29	PVAC	Makes final changes & issues to PGM
65	PVA30	Proponent	Sends final PVA report to users
66	PVA Report		PVA Report complete
67	END PVA		End of the PVA process
68	**RFP Development Phase**		
69	Begin RFPDev		Begin the RFP Development Phase
70	RFP Dev1	CFSC-CO	Seeks design start approval from ASAs
71	RFP Dev2	ASA(I&E)	Provides selective design start approvals
72	RFP Dev3	CFSC-CO	Develops project mgt plans w/ attachments & enclosures
73	RFP Dev4	CFSC-CO	Sends acquisition plans to CFSC-NC
74	RFP Dev5	CFSC-NC	Selects and notifies most qualified A/E firms
75	A/E Selected		A/E firm is selected
76	RFP Dev6	CFSC-NC	Schedule & hold prenegotiation RFP development meets
77	RFP Dev7	CFSC-NC	Negotiates and awards RFP development contract to A/
78	RFP Dev9	A/E	Develops RFP and attachments draft
79	RFP Dev10	Proponents	Review/approve draft RFP & comment
80	RFP Dev12	A/E	Develops final RFP & submits to CFSC
81	RFP Dev11	CFSC-CO	Review/approve draft RFP & comment
82	RFP Dev13	CFSC-CO	Performs final review & approval of RFP
83	RFD Dev14	CFSC-NC	Finalizes RFP
84	RFD Dev15	CFSC-NC	Reproduces RFP Package
85	End RFP DEV		End RFP Development Phase Concepts, description, sp
86	**Program Review/Approval Phase**		
87	Begin PrgRev		Begin the Program Review and Approval Phase
88	Prog Rev1	CFSC-CO	Reviews & updates DD1391s project submissions
89	Prog Rev2	EXCOM	Reviews & recommends NAF program funding approval
90	Prog Rev3	BoD	Reviews & approves NAF program funding
91	Funds Approval		NAFMC funding approved & TOA established
92	Prog Dev10a	CFSC-CO	Consolidates/validates DD1391 submissions
93	Prog Rev7	CFSC-CO	Prepares NAF project 'Greenbook'
94	Prog Rev8	ASA(MR&A)	Reviews/approves project submissions (greenbook)
95	Prog Rev9	ASA(I&E)	Reviews/ approves project submission (greenbook)
96	Greenbook		Greenbook finalized and ready for approval
97	Prog Rev10	OASD(PSF&E)	Reviews, approves, & consolidates NAF program
98	Prog Rev11	HASC	Subpanel reviews/ approves selective NAF program
99	Program Release		NAFMC program released for execution
100	End ProgRev		End of Program Review and Approval Phase
101	**Contractor Acquisition Phase**		
102	Begin Acquisition		Begin D/B Contractor Acquisition Phase
103	Acquis1	CFSC-CO	Requests RM perform construction fund cert
104	Acquis2	CFSC-RM	Certifies adequate funds are available
105	Acquis3	CFSC-NC	Advertises for D/B contractors
106	Acquis4	D/B Contr.	Responds to proposal requests
107	Acquis5	CFSC-NC	Evaluates proposals
108	Acquis6	CFSC-NC	Gets D/Bs to submits BAFCs if necessary
109	Acquis7	CFSC-NC	Selects most qualified D/B contractor
110	Acquis8	CFSC-NC	Awards construction contract to GC
111	Acquis9	CFSC-NC	Issues NTP to D/B contractor, prepares BCM/verifies bo
112	End Acquis		End of D/B Acquisition Phase
113	**Project Design Phase**		
114	Begin Design		Begin Facility Design Phase

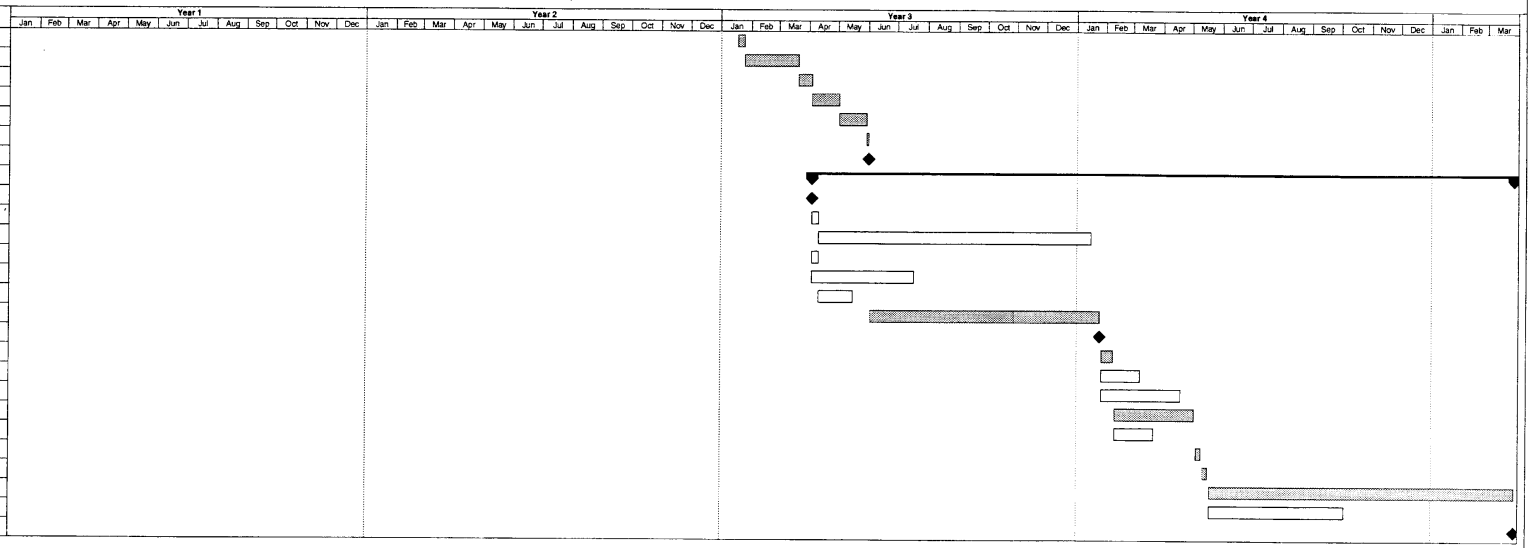


Project:
Date: Nov 14 '94

Non-critical Task | Critical Task | Milestone | Summary

Proposed Project Delivery Process - Design-Build
GANTT Chart

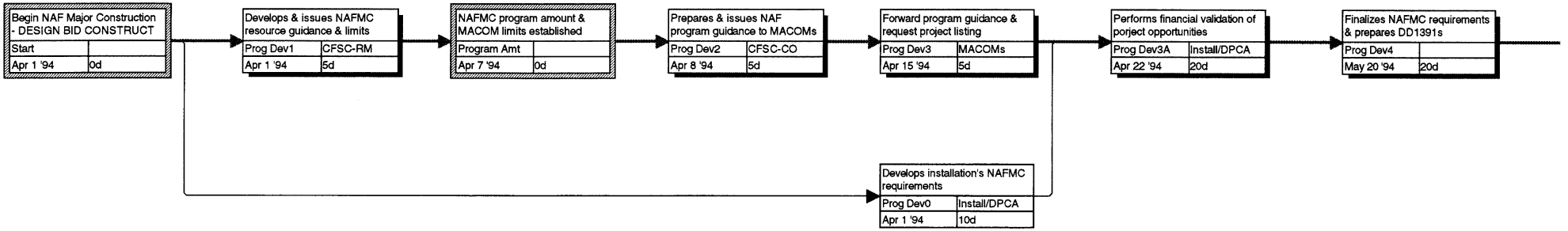
ID	Task Name	Responsible	Description
115	Design0	CFSC-NC	Schedules and convenes predesign conference
116	Design1	D/B Contrctr	Completes 50% design with 100% site & foundation
117	Design2	CFSC-CO	Reviews plans and provides concurrance
118	Design3	D/B Contrctr	Finalizes design/provides continuing support
119	Design4	CFSC-CO	Reviews and provides final concurrence with plans
120	Design5	CFSC-NC	Issues NTP for 100% construction
121	End Design		End of D/B Design Phase
122	**Construction & Closeout Phase**		
123	Begin Constr		Begin construction phase
124	Construct14	CFSC-NC	Assigns title II services to USACE district or other
125	Construct15	USACE/Other	Provides on-going construction/quality mgt.
126	Construct1	CFSC-CO	Issues limited NTP for site & foundation work
127	Construct2	D/B Contrctr	Mobilizes to job site
128	Construct3	D/B Contrctr	Begins construction - site work and foundation
129	Construct5	D/B Contrctr	Finalizes facility construction
130	Facility Complete		Facility is substantially complete
131	Construct6	CFSC-CO	Performs pretinal inspection & punch list
132	Construct11	D/B Contrctr	Final demobilization from the job site
133	Construct12	CFSC-CO	Responds to final modifications & claims
134	Construct7	D/B Contrctr	Corrects punchlist deficiencies
135	Construct10	User	Occupies the facility
136	Construct8	CFSC-CO	Performs final inspection & facility acceptance
137	Construct9	CFSC-CO	Accepts facility
138	Construct 16	User	Monitors facility warrantees and guarantees
139	Construct13	USACE Dist.	Performs financial & contract close-out
140	End		NAFMC Process Complete & Financial Close-out



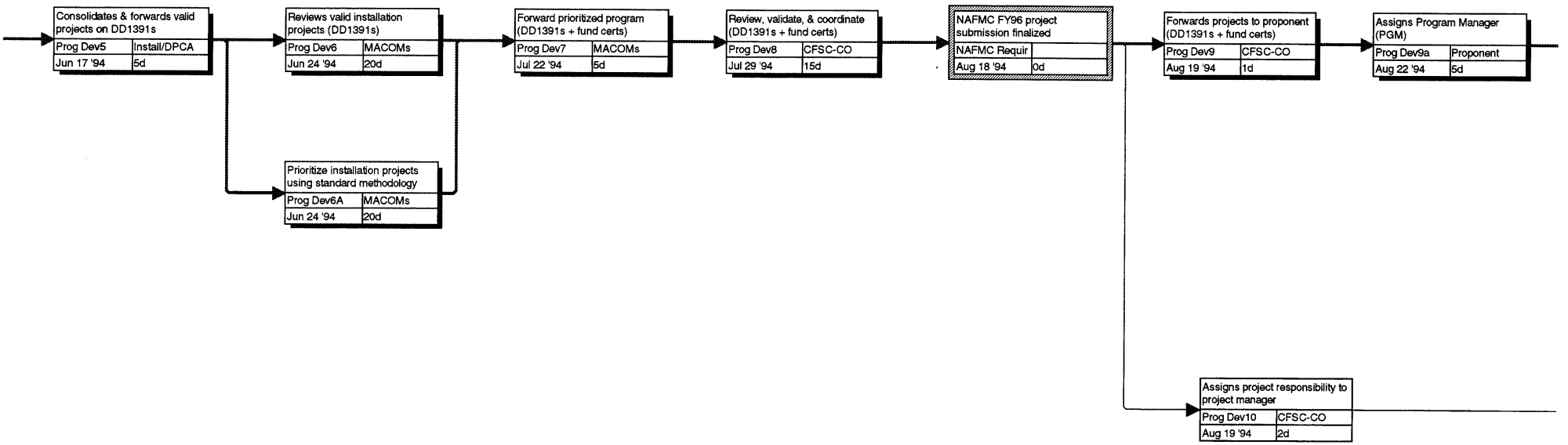
Project:
Date: Nov 14 '94

Non-critical Task | Critical Task | Milestone | Summary

Proposed Project Delivery Process - Design-Bid-Construct



Proposed Project Delivery Process - Design-Bid-Construct



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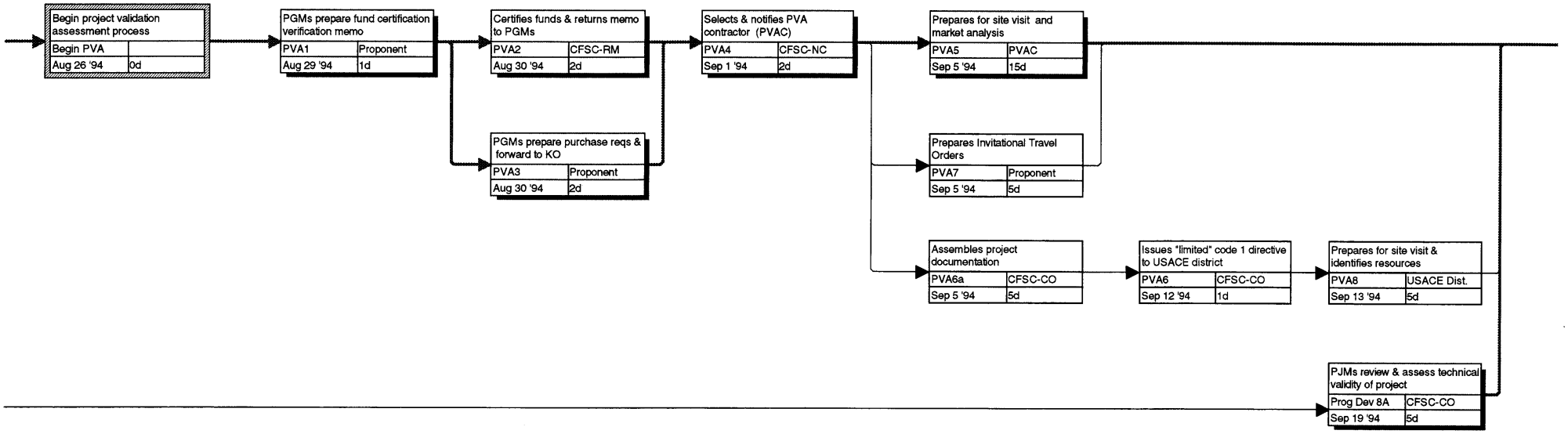

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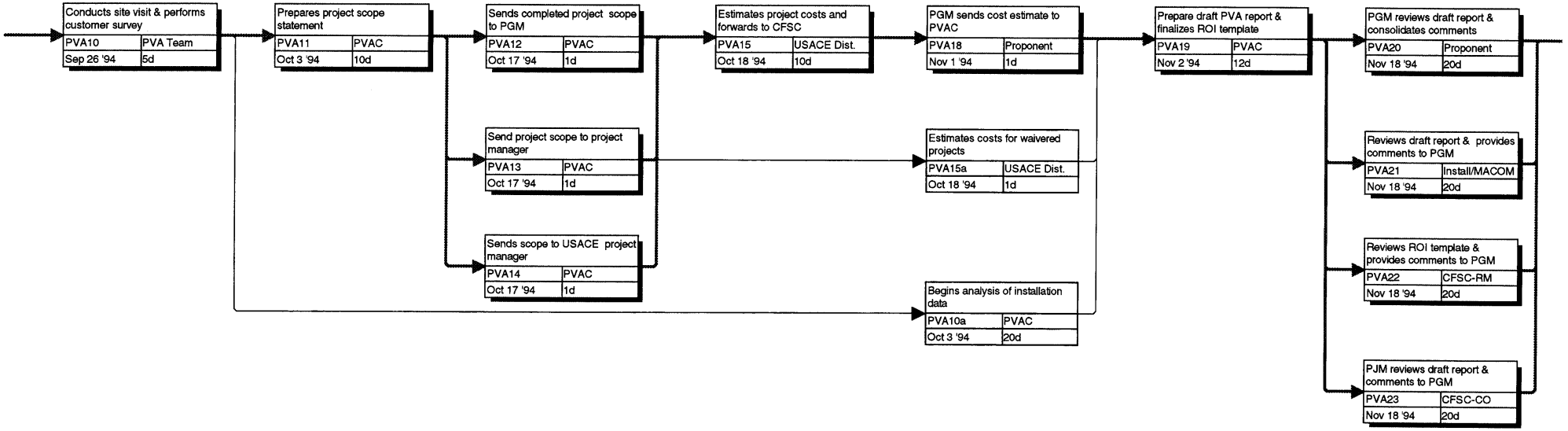

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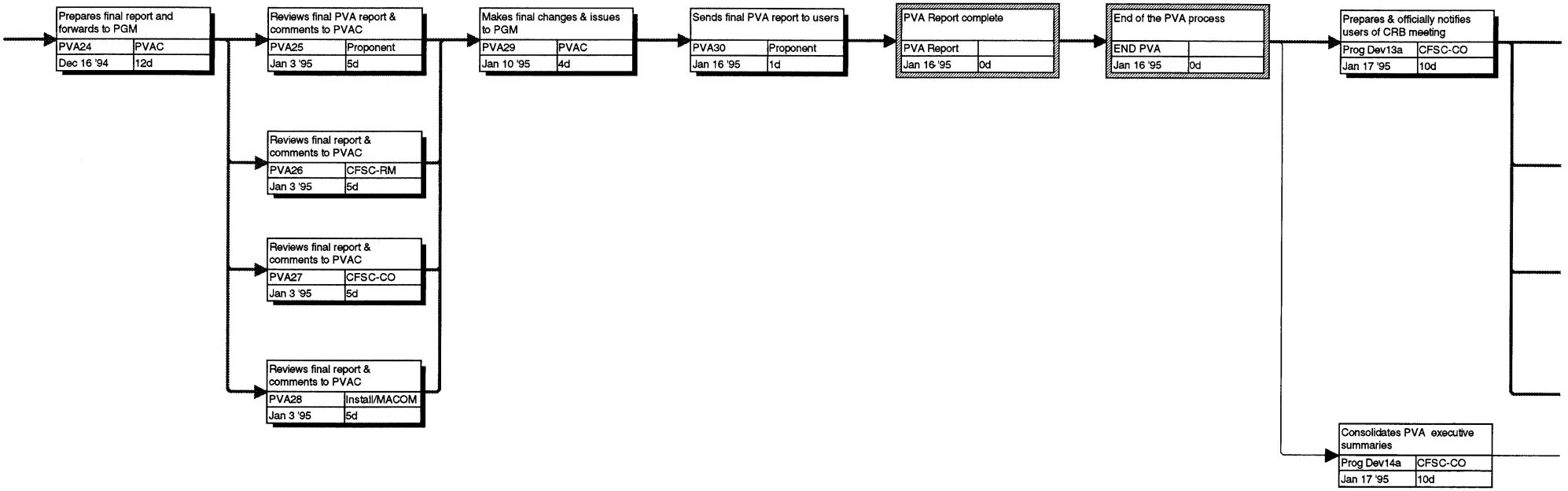

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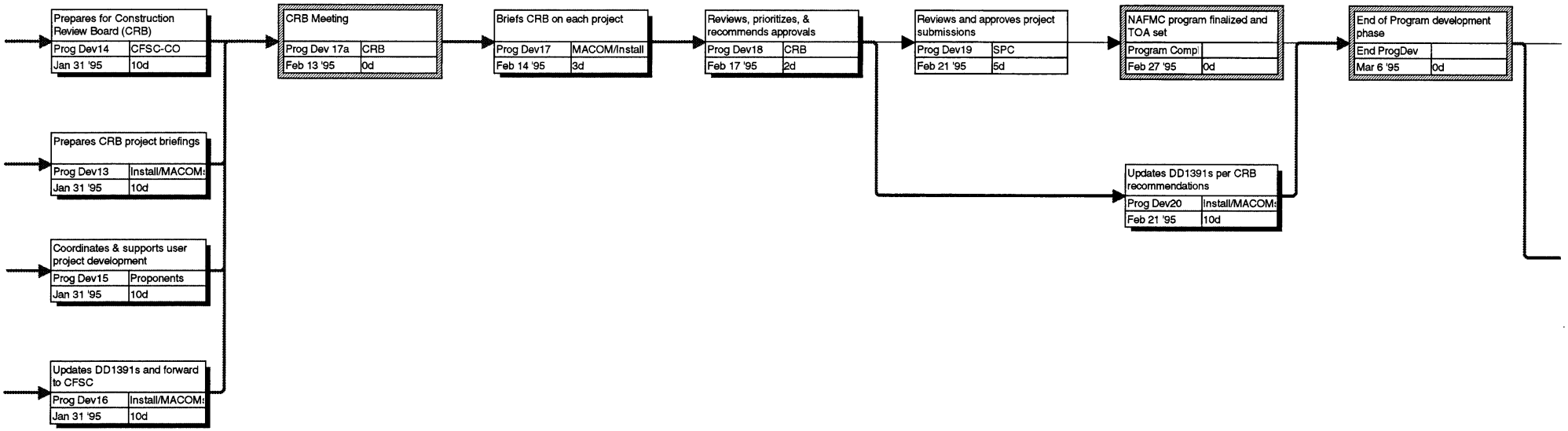

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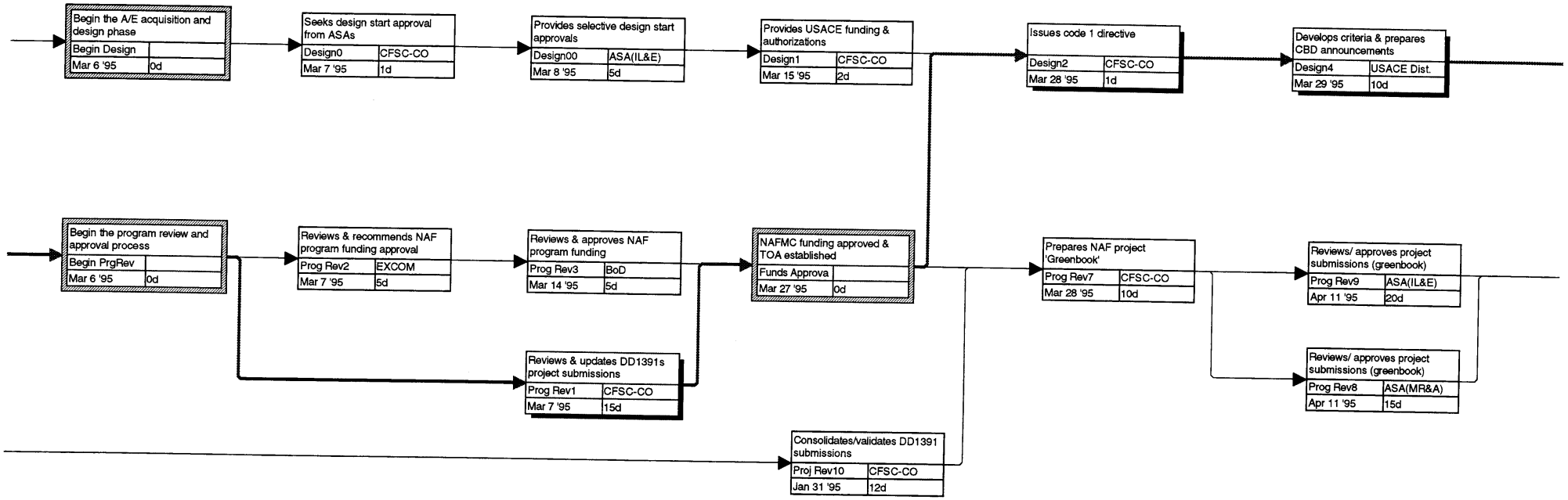

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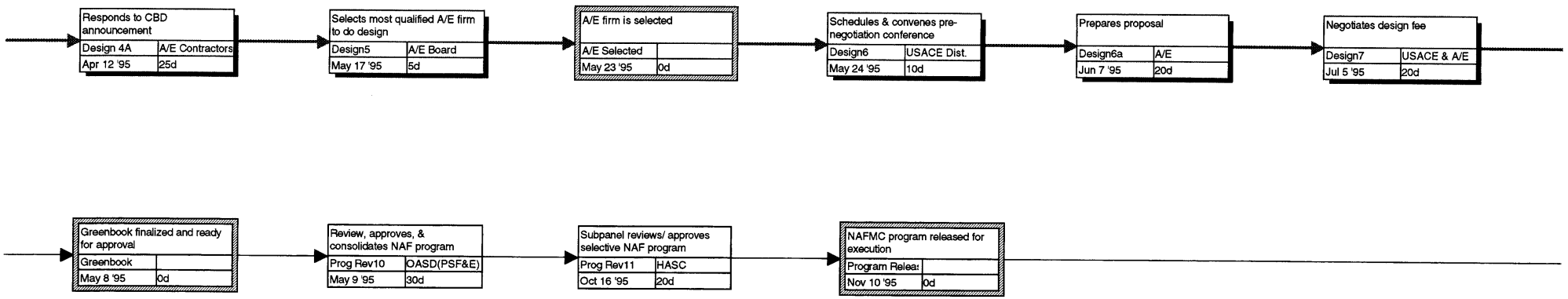

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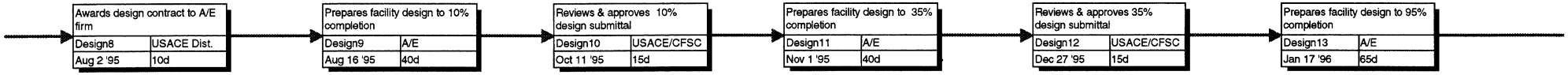

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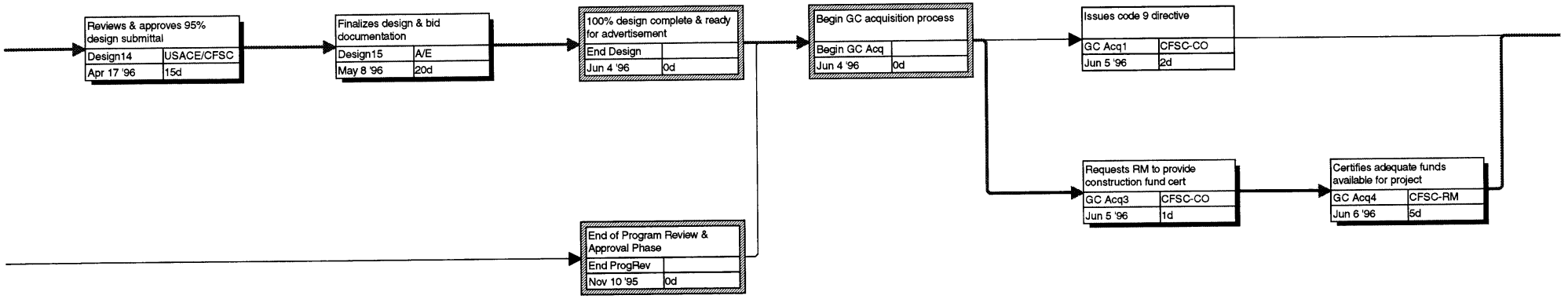

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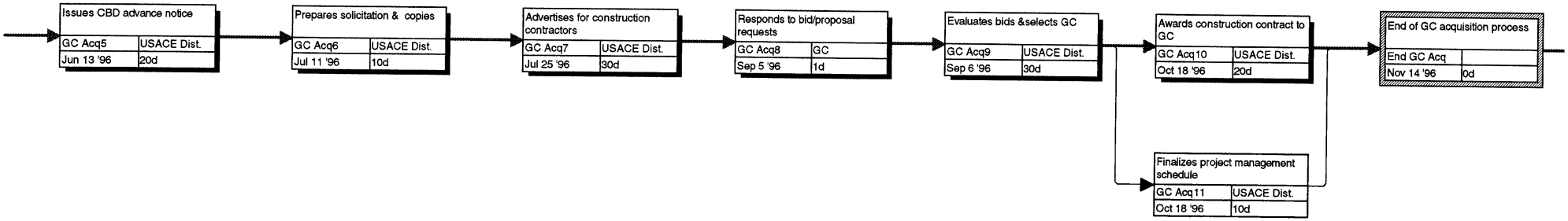

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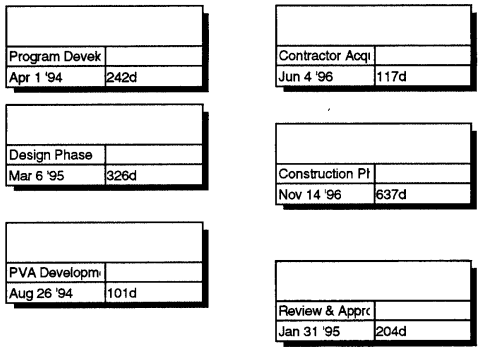
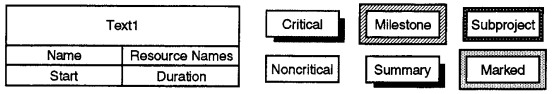


Proposed Project Delivery Process - Design-Bid-Construct

Project: NAFMC Design-Bid-Construct
Date: Sep 1 '94



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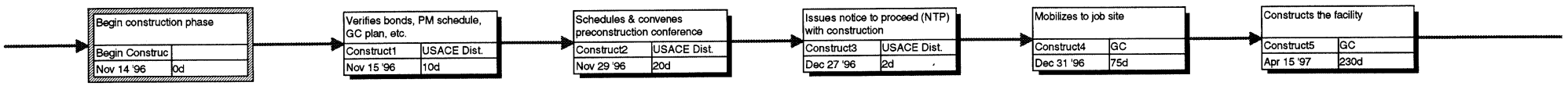

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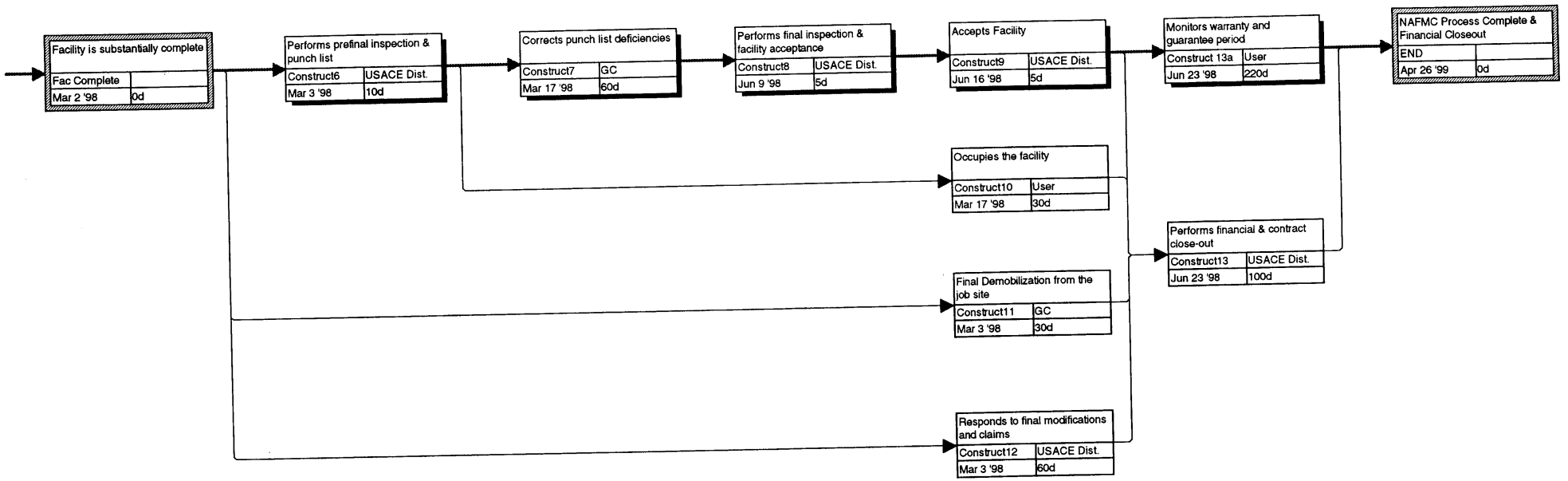

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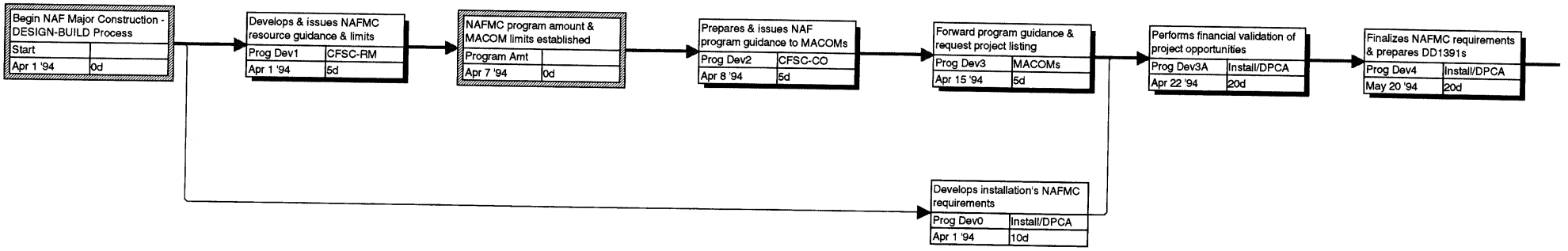
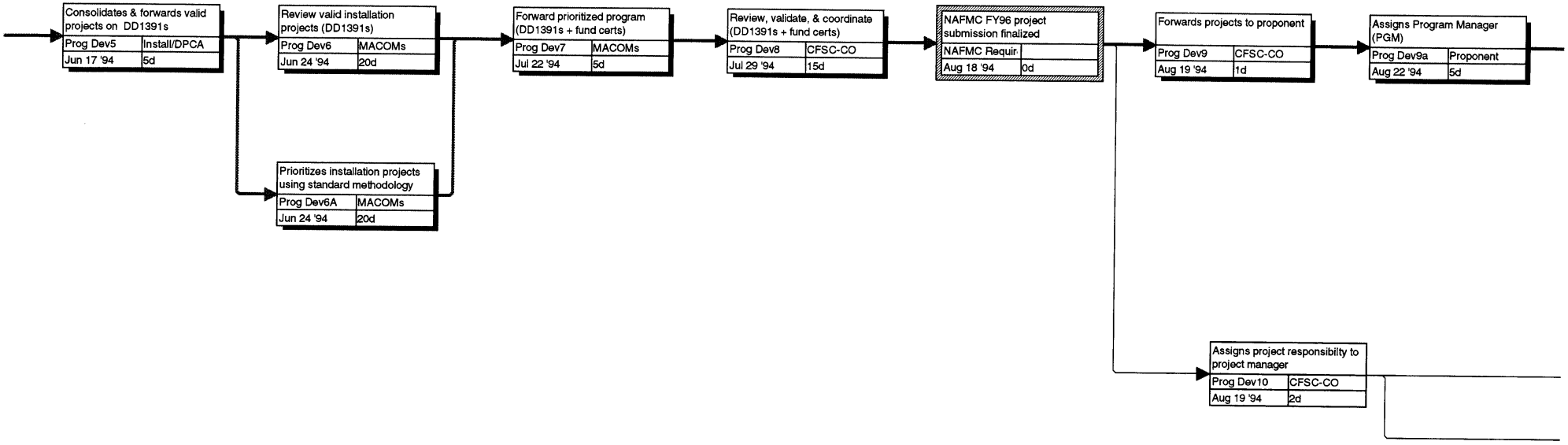
Proposed Project Delivery Process - Design-Build

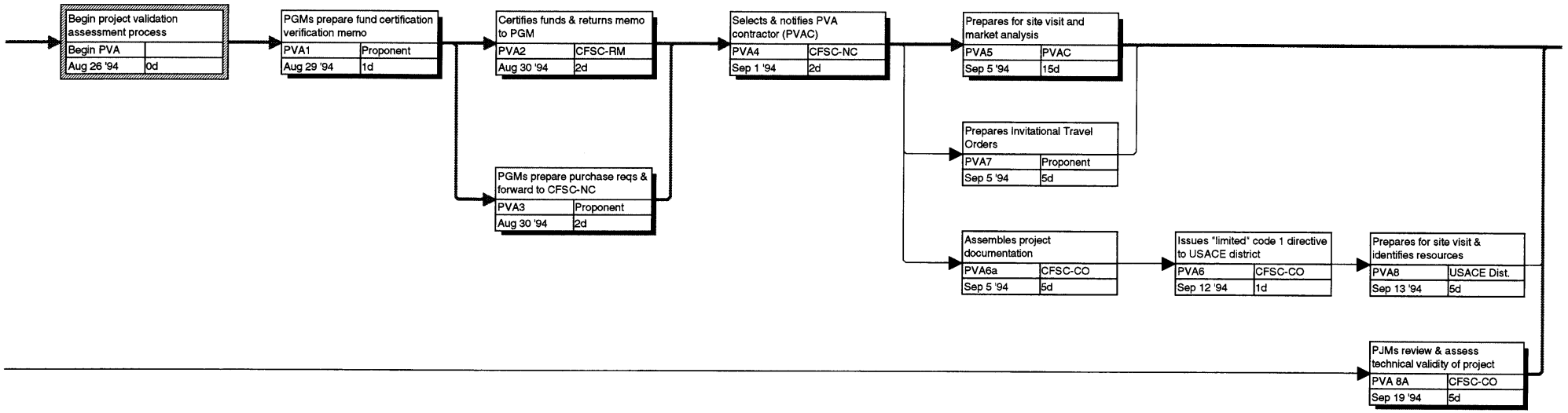


Sep 1 '94

Proposed Project Delivery Process - Design-Build



Proposed Project Delivery Process - Design-Build



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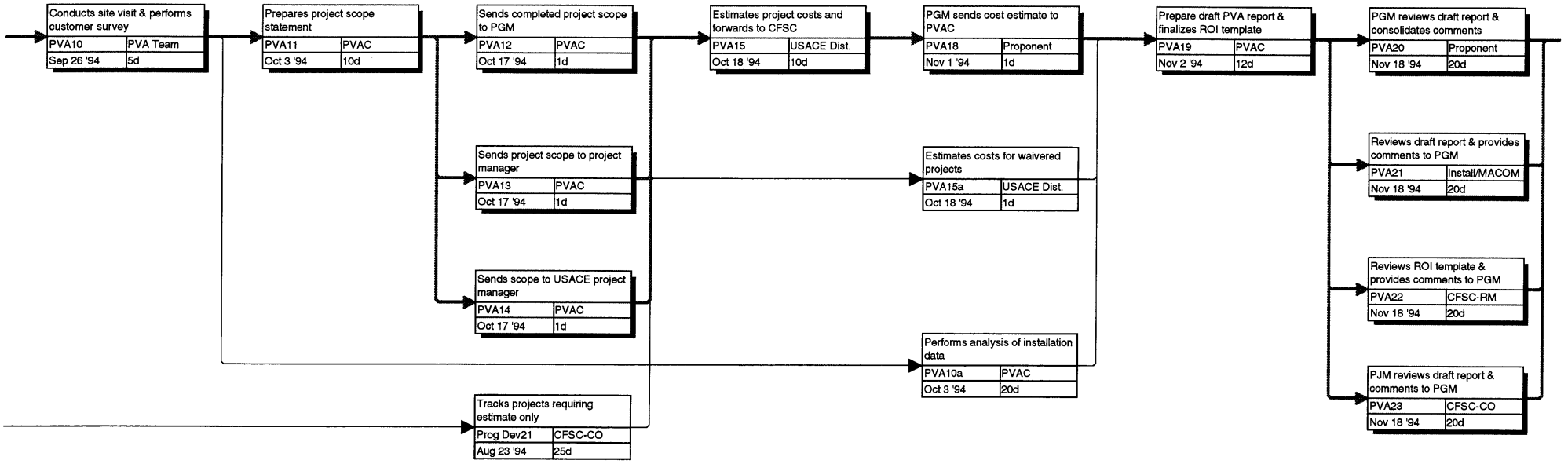

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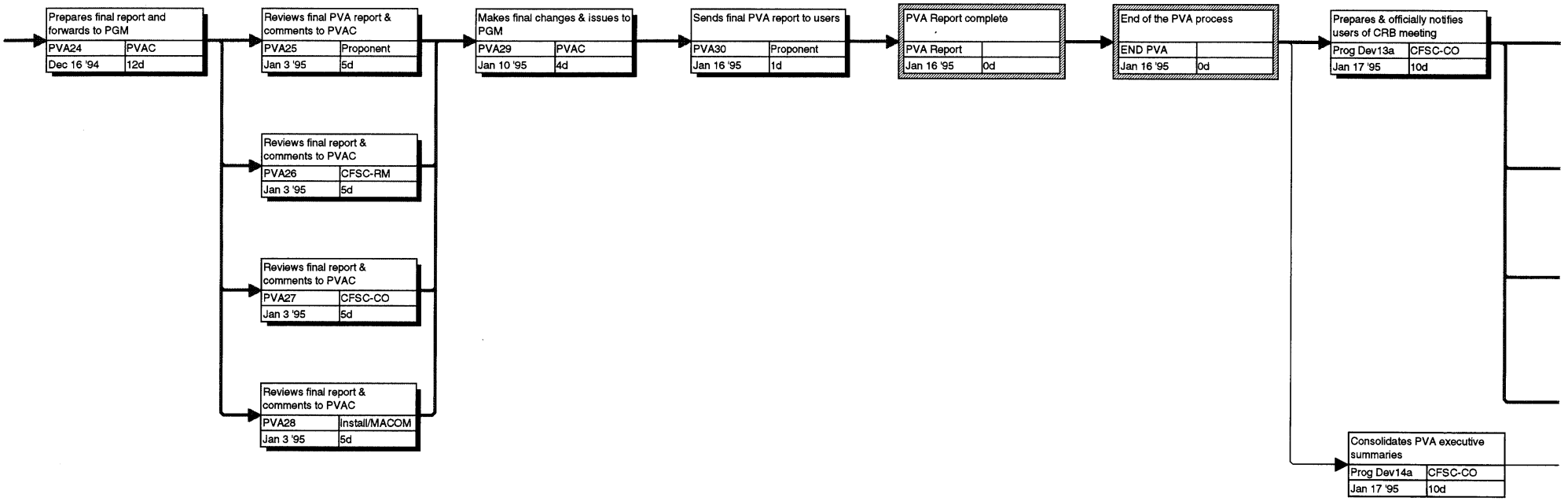

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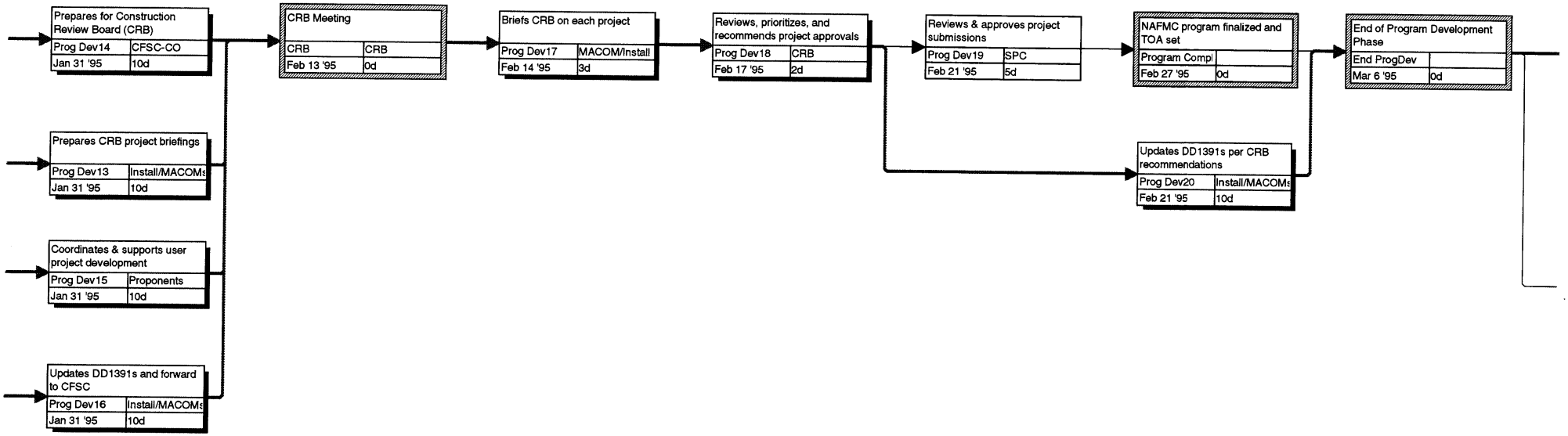

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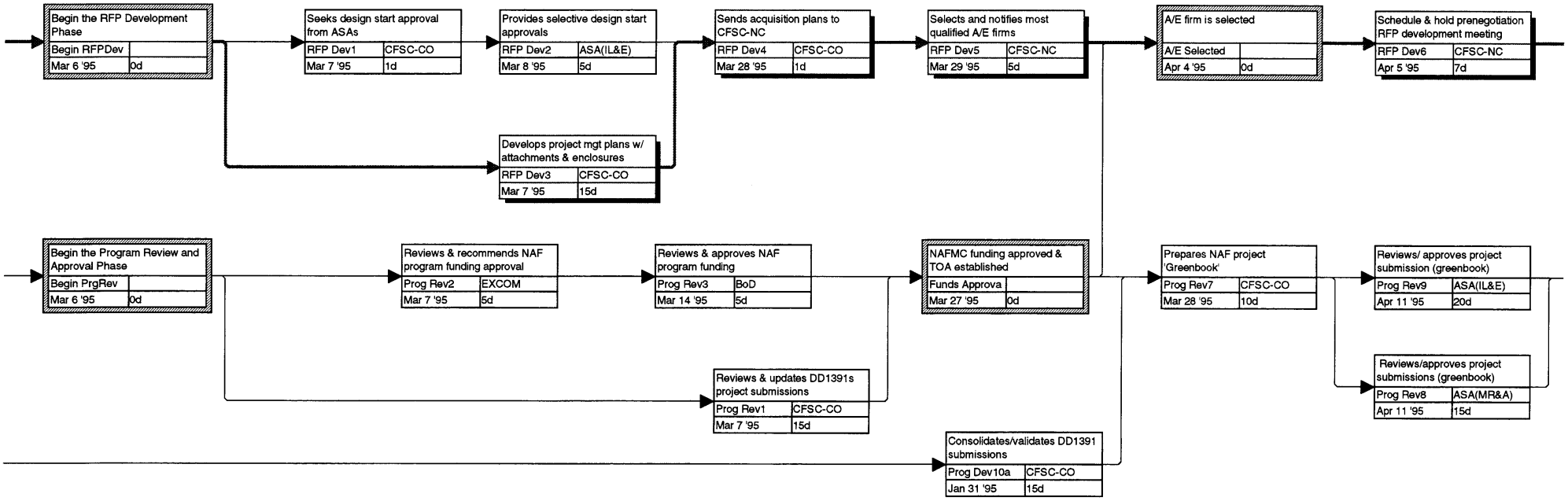
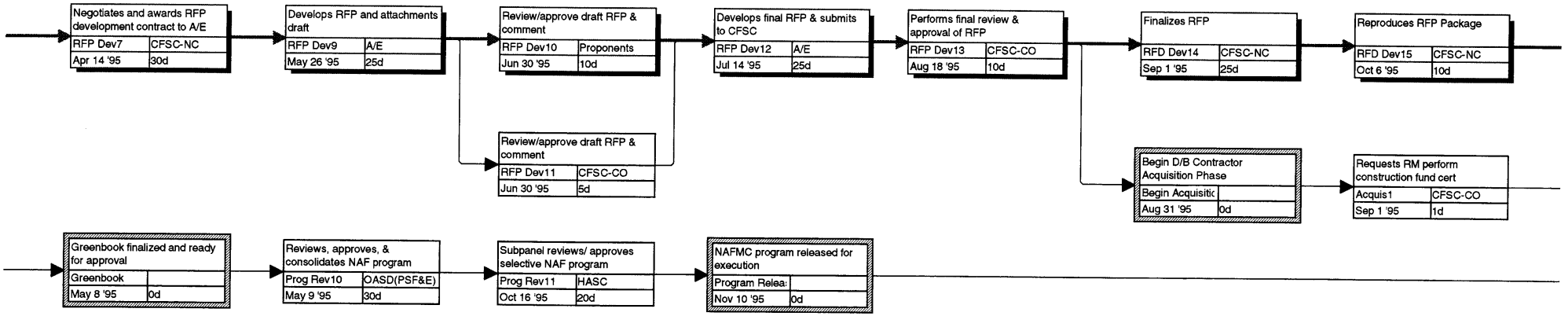


Proposed Project Delivery Process - Design-Build



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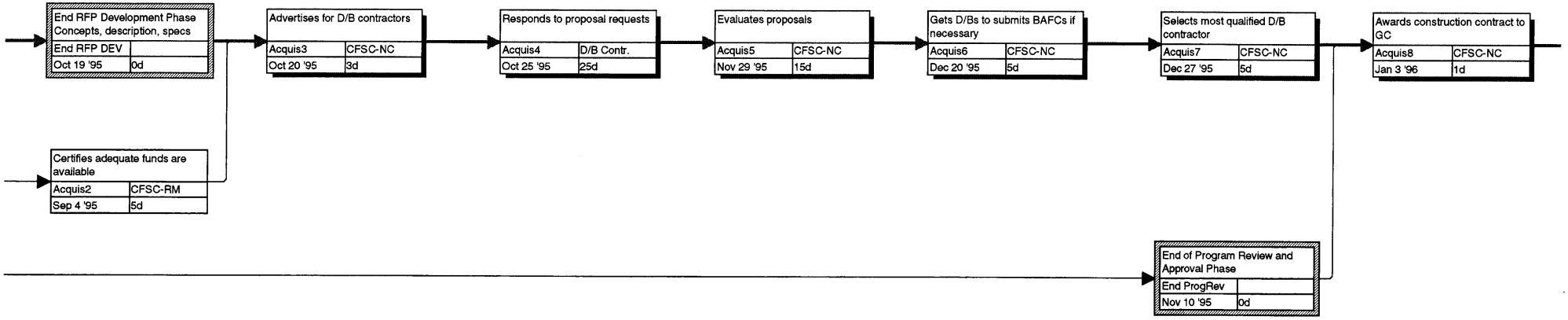

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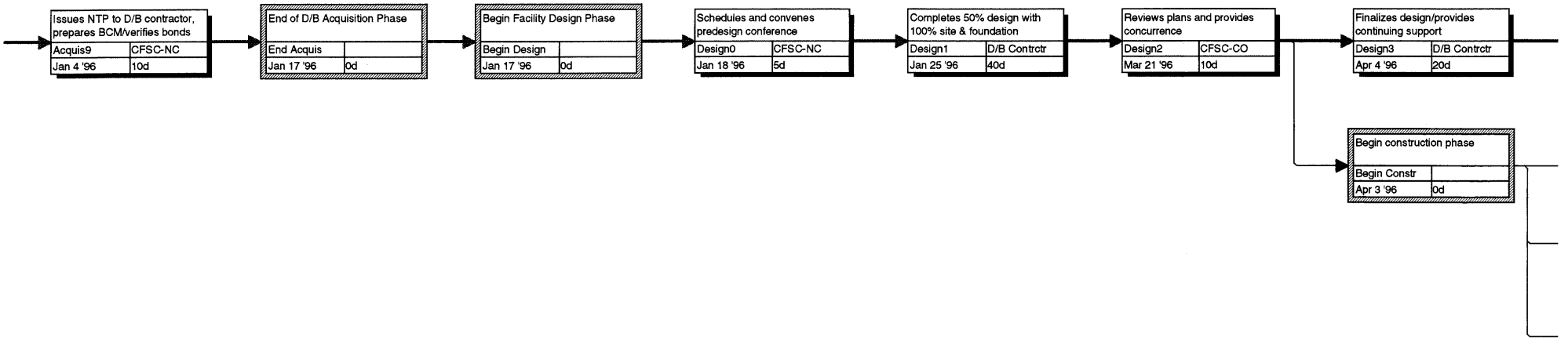

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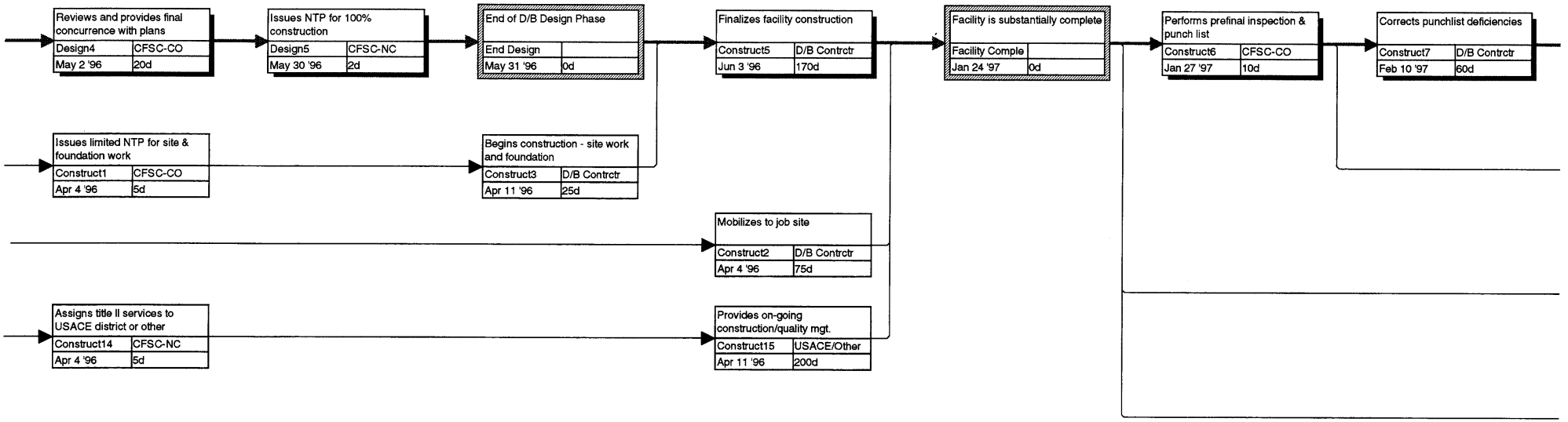

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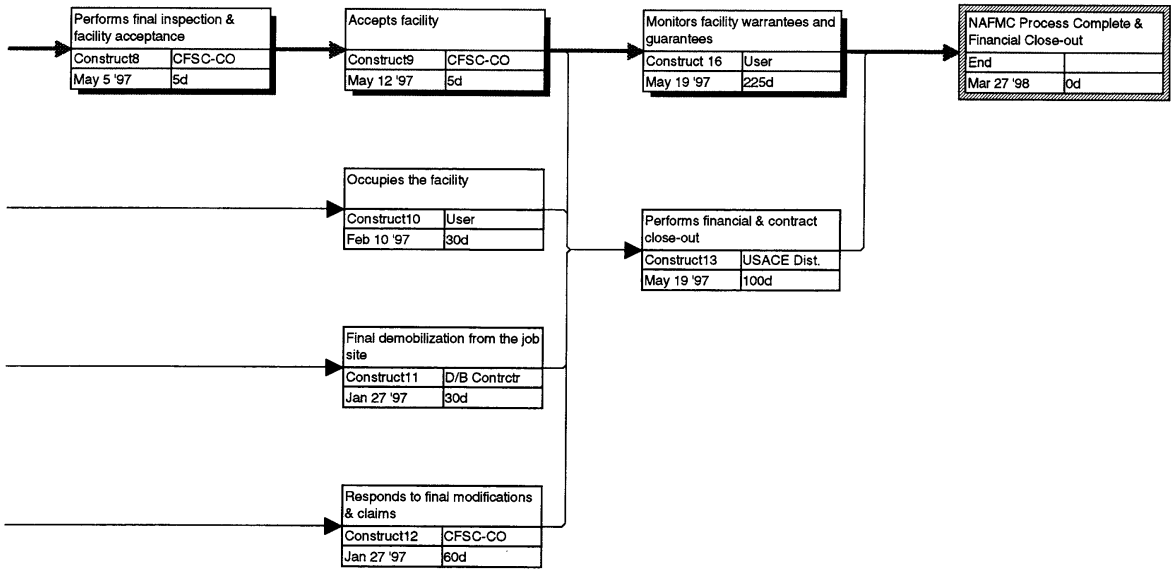

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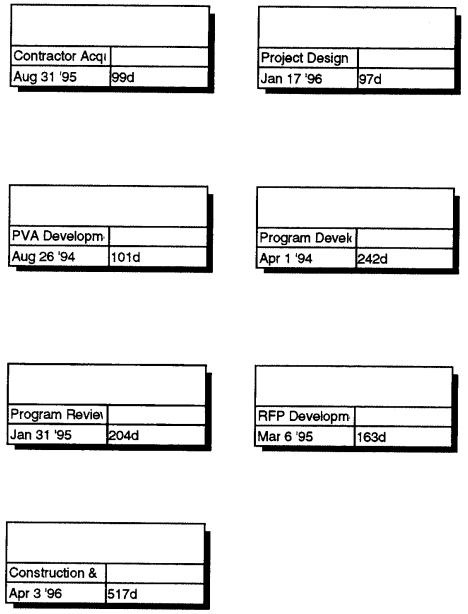
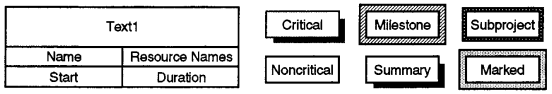


Proposed Project Delivery Process - Design-Build

Project:
Date: Sep 1 '94



APPENDIX G

Proposed NAF Major Construction Prioritization Matrix

Proposed NAF Major Construction Prioritization Matrix

The prioritization matrix depicted in this appendix is a proposed format that both the Major Commands (MACOMs) and the Construction Review Board (CRB) can use to prioritize projects seeking nonappropriated funds major construction (NAFMC) funding. This matrix is the result of improvements to an existing NAFMC prioritization matrix as well as extensive research with NAFMC process participants to determine what factors are most pertinent to a project's success. The factor weights reflect LMI's suggested weighting based upon discussions with NAFMC process participants. The actual weights used in a given year should be determined through some type of analytical hierarchy process such as the one used in the software package called "Expert Choice."

The MACOMs can use this prioritization matrix to rank projects to determine which ones warrant the conduct of a Project Validation Assessment (PVA). Once those PVAs are completed and the MACOMs have submitted their package of projects for review, the CRB can then, in turn, incorporate into the matrix the latest financial and market data reflected in the most recently completed PVAs, thus prioritizing all of the projects in the NAFMC program. CRB members will then be required to vote on a project only if it is at the margin, i.e., just above or below the funding "cut line."

NAF Major Construction Prioritization Matrix

Prioritization criteria	Score 50	40	30	20	10	0	-10	Weights (%) (a)	Total score
I. Return on investment									
A. IRR (b) (Cat C only) AND	Top fifth	2nd fifth	middle fifth	4th fifth	bottom fifth	neg. IRR		7.50	3.75
B. Payback in years (Cat C only)	0-5 years	5-10 years	11-15 years	16-20 years	21-30 yrs.	30+ yrs.		2.50	1.25
OR									
C. Needs assessment (Cat B)	Top sixth	2nd sixth	3rd sixth	4th sixth	5th sixth	bottom sixth		10.00	5.00
II. Projected incr./decr. in annual APF support	$50k+ decr.	$21-50k decr.	$10-20k decr.	<$10k decr.	no change	Incr <$100K	Incr <$100k	5.00	2.50
III. MACOM priority	Highest	2nd highest	3rd	4th	5th	6th		30.00	15.00
IV. Type of facility	multi-use			Single purpose				5.00	2.50
V. Facility location (c)	R&I OCONUS	R&I CONUS	Non-Metro	Small Metro	Big Metro			5.00	2.50
VI. Availability of similar off-post alternatives	no alt.		some alt.			many alt.		5.00	2.50
VII. Proportion of base population served	68% or more	67%-56%	55%-48%	47%-41%	40%-34%	33.33% or less		15.00	7.50
VIII. No. of AMWRF-funded projects appvd prev. 5 yrs.	0	1	2	3	4	5 or more		5.00	2.50
IX. Certainty of assumptions underlying I, II, VII (d)	Little uncert.			Some uncert.		Much uncert.		20.00	10.00
Total:								100.00	50.00

Notes:

(a) Should be determined through "Expert Choice" drill with MACOM reps.

(b) IRR ranking will be determined by rank ordering all NAFMC projects in descending order by IRR and grouping projects (with positive IRRs) into 5 even groups

(c) List of Remote & Isolated bases are contained in Table 4-1 in AR215-1, Chapter 4.

Definitions: Non-metro = non Metropolitan Statistical Areas (MSAs) and MSAs with <125K '92 pop; Small Metro = MSAs btwn. 125K-375K 92 pop.; Large Metro = MSAs with >375K 92 pop.

(d) Includes such things as: BRAC impacts, troop movement impacts, potential environmental impacts, and the like.

APPENDIX H

Assessment of Construction Cost Estimates

Assessment of Construction Cost Estimates

In addition to identifying ways to improve the nonappropriated funds major construction (NAFMC) project delivery process, the Logistics Management Institute (LMI) was also tasked to evaluate the accuracy of the construction cost estimates used in the process. The process used to develop cost estimates for NAFMC projects has evolved over the years.

Prior to the FY89 program, installations were responsible for developing cost estimates on NAFMC projects. Typically, they used the Corps district cost estimator or the Directorate of Engineering and Housing construction specialist. Starting with the FY89 program, installations were required to rely upon the construction cost estimates developed by the contractors conducting the project validation assessments (PVAs).

The PVA contractors had been involved with NAFMC since FY86, when the House Armed Services Committee (HASC) started requiring the Community and Family Support Center (CFSC) to acquire the services of third parties to conduct independent, unbiased feasibility assessments of projects to be submitted to the HASC for approval.

In FY90, the HASC issued a construction moratorium on the NAFMC program which delayed that year's projects until the following year. When the FY91 program was submitted, it consisted of many projects originally submitted the year before. The result of this delay was an inordinate amount of variation in cost estimates and contract awards of those projects that had originally been developed in FY90. This variation was due to the fact that the project cost estimates were not up-to-date and therefore did not reflect prevailing market conditions.[1]

Because of the variation observed between the PVA contractor-developed cost estimates and the construction award amounts, CFSC decided to institute a quality assurance check beginning with the FY93 program and requested that USACE validate the construction cost estimates developed by the PVA contractors. Since FY93, all installations are required to have cost estimates validated by the appropriate local Corps district cost estimator before their project request can be reviewed by CFSC.

[1] Also during those years, the construction industry in certain regions of the country was beginning to tighten up because of construction demands brought about by the various natural disasters, including the earthquake in San Francisco and Hurricane Andrew in Florida.

To assess the accuracy of the NAFMC cost estimates, we calculated the percentage difference between the program amount approved by the HASC and the certified construction award amount [less any funds for supervision and review (S&R); design; or furniture, fixtures, and equipment (FF&E)]. We then compared the results to the margin of error used as an estimating standard by the construction industry. We assumed that, to be considered accurate, the NAFMC cost estimates should have the same margin of error as that required for industry cost estimates, given a comparable level of effort to develop those estimates.

The following sections describe the cost-estimating standards used by the construction industry and present our findings concerning the accuracy of the NAFMC cost estimates by year, location (U.S. versus OCONUS projects), and project execution approach, as well as our findings concerning reprogrammed projects.

INDUSTRY COST ESTIMATING STANDARDS

The construction industry uses four broad types of cost estimates, as depicted in Table H-1. As the level of effort increases, both in terms of number of person-days and costs, the margin of error decreases. The gross estimate, for example, uses general metrics to approximate the construct cost. Its margin of error is fairly large — plus or minus 20 percent — but the level of effort and cost to develop a gross estimate are minimal.

Table H-1.
Construction Industry Cost Estimating Standards for Accuracy

Estimate type	Margin of error (percent, + or -)	Level of effort	Fully burdened average cost ($)
Gross	20	1 hour	100
Parametric	15	1 – 2 days	800 – 1,600
System/assembly, no site visit	5 – 10[a]	4 – 5 days	3,200 – 4,000
System/assembly, with site visit	5 – 10[b]	9 – 10 days	7,200 – 8,000
Unit takeoff	5 – 7	15 – 20 days	12,000 – 16,000

[a] Based on discussions with cost estimation specialists at RS Means, Inc.

[b] Should be around 5 percent, as long as scope is clear and site analysis is performed well.

Parametric estimates are refinements of the gross estimates and take 1 to 2 days to develop; as one would expect, the margin of error is smaller — plus or minus 15 percent. The system/assembly level of estimation requires 4 to 10 days, depending on whether a site visit is required, and has a 5 to 10 percent margin of error. The unit takeoff estimate, which the industry considers the most accurate, entails the largest expenditure of effort — 15 to 20 days — and costs considerably more than the system/assembly estimate. Note, however,

that the unit takeoff estimate is not significantly more accurate than the system/assembly estimate.

Because it most closely approximates the level of effort that CFSC reserves for the development of a project cost estimate (roughly $10,000, including a site visit), we chose the site/assembly estimate as our benchmark for assessing the accuracy of NAFMC's estimates. That is, to be considered accurate, the margin of error, or mean cost differential, for NAFMC cost estimates must be plus or minus 10 percent. A 5 percent margin of error would be exceptionally good, and a 15 percent margin of error would be unacceptable.

NAFMC Estimates by Year

Table H-2 shows the mean cost differential and the standard deviation around that mean for FY87 through FY93.[2] Contrasting the performance of NAFMC program with industry benchmarks, the cost estimation accuracy of the NAFMC program appears to be quite good overall. For the seven-year period as a whole, the average cost differential was only 6.9 percent, with a standard deviation of 16.8 percent.

Table H-2.
Statistical Comparison of NAFMC Projects by Year

Fiscal year	Number of projects	Mean cost differential percent	Standard deviation percent
1987	25	0.5	16.6
1988	50	8.1	17.5
1989	26	10.0	14.2
1990	17	2.9	11.3
1991	20	12.0	15.1
1992	10	10.5	21.2
1993	15	3.9	21.6
Total	163	6.9	16.8

In terms of individual years, nearly every year except for FY91 exhibited a cost differential that was about 10 percent or less. However, as previously discussed, the FY91 program was unique because it included FY90 projects that had been deferred due to the construction moratorium and because many of the FY90 projects were resubmitted in FY91 without the benefit of an updated cost estimate, increasing the likelihood of estimation error. As a result, many of the

[2]We excluded the FY94 program because so few construction contracts had been awarded at the time of our analysis, due in large part to congressional delays, that the results of our statistical analysis would not be a fair representation of performance.

construction contracts were awarded at higher levels than would be expected if the cost estimate had reflected prevailing market conditions.

The standard deviation for recent years tends to be high. Adding the mean and one of its standard deviations for any of the last three fiscal years results in a total that exceeds the 125 percent of program amount threshold. This is an indication that there are many instances in which the differential between the construction award amount and the original program amount is at or approaching the 25 percent threshold at which it must obtain reprogramming approvals from Congress.

NAFMC Estimates by Location

Table H-3 illustrates the mean cost differential, and standard deviation around that mean, between the program amounts and the award amounts for projects according to their location. The cost differentials are surprisingly similar, but the standard deviation is higher for overseas projects than for U.S. projects. (Certified construction cost award amounts for many of the OCONUS projects were adjusted to correct for FY87 and FY88 currency fluctuations.)

Table H-3.
Statistical Comparison of NAFMC Projects by Location

Location	Number of projects	Mean cost differential percent	Standard deviation percent
United States	114	6.9	16.0
Overseas	49	6.8	19.0

Figures H-1 and H-2 depict the frequency distribution of the cost differential for U.S.-based and overseas-based NAFMC projects, respectively. Although their means are virtually identical, the distribution pattern around the mean is tighter for U.S.-based projects than for OCONUS projects. Possible explanations for these differences include wider variations in the costs of raw material and labor, less homogeneous market conditions in overseas markets, differences in industry practices, and more burdensome foreign government regulations or practices.

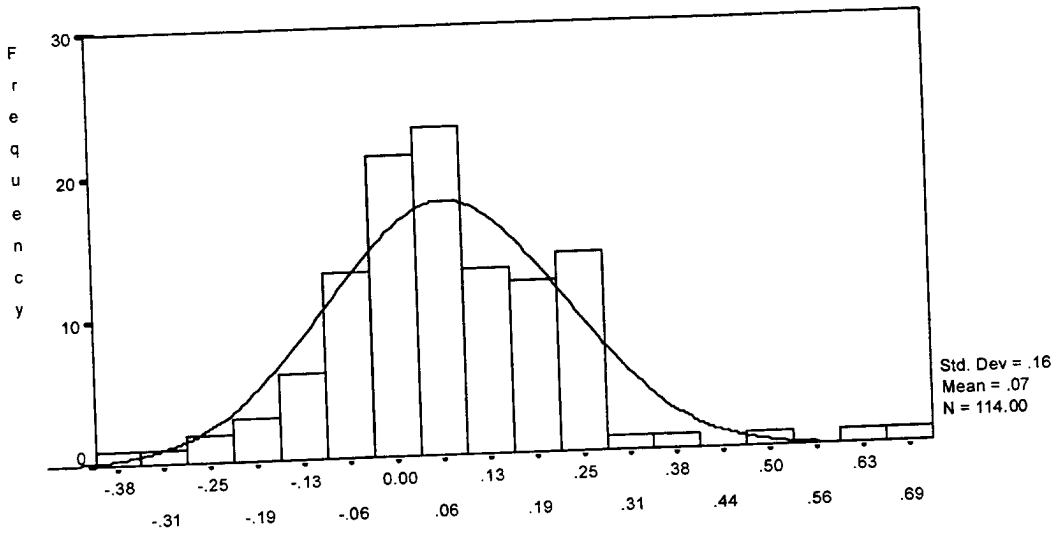


Figure H-1.
Frequency Distribution for NAFMC Program Cost Estimation Differential — United States Projects (FY87 - FY93)

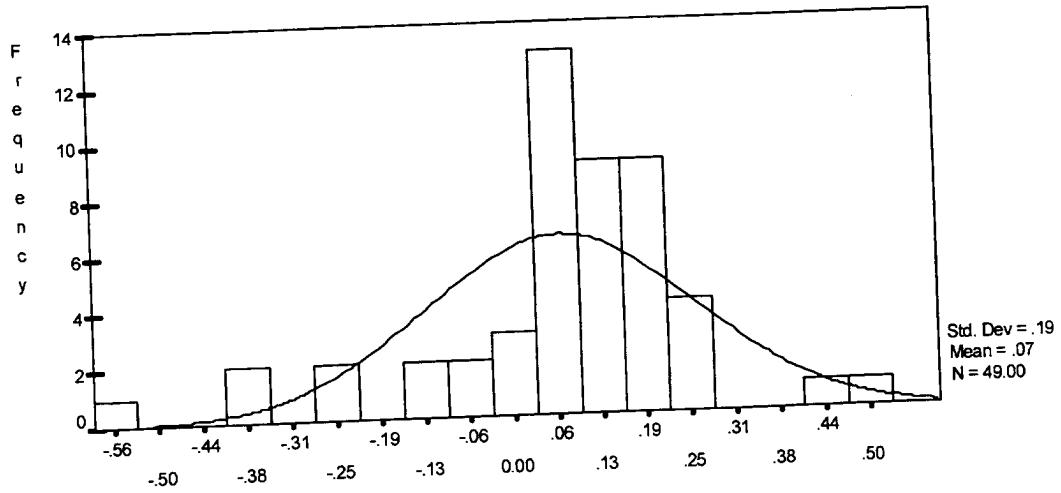


Figure H-2.
Frequency Distribution for NAFMC Program Cost Estimation Differential — Overseas Projects (FY87 - FY93)

NAFMC Estimates by Project Execution Approach

Table H-4 shows the mean cost differential, and standard deviation around the mean, between the program amounts and the construction award amounts for projects executed using the traditional design-bid-construct approach and those using the design-build approach. A surprising result of our statistical analysis is that the average cost differentials for the three different methods are within 2 percentage points of one another. The lowest mean cost differential of 5 percent is for Corps projects executed using the design-build approach.

Table H-4.
Statistical Comparison of NAFMC Projects by Execution Approach

Method of execution	Number of projects	Mean cost differential percent	Standard deviation percent
Design-bid-construct	142	6.9	17.0
CFSC design-build[a]	5	7.0	12.0
Corps design-build	15	5.0	13.0

[a]In-house design-build figures exclude the FY89 Fort Leonard Wood Guest House project, which encountered significant programming errors and, consequently, is not representative of a typical in-house design-build project. Including this project increases the mean and standard deviation to 10 percent and 13 percent, respectively.

The results depicted in Table H-5 provide strong evidence that the perception that significant differences exist in the cost estimation accuracy between the Corps- and CFSC-executed projects is without foundation. One caveat to the results is that our sample of five CFSC design-build projects is probably too small to use as a basis for final conclusions regarding in-house performance. Nevertheless, there appears to be relatively little evidence supporting the notion that cost estimation accuracy is a function of project execution method, at least in the case of the NAFMC program.

Reprogrammed Projects

Another way to assess the quality of NAFMC project cost estimates is to look at the number of projects that required reprogramming from Congress, that is, the number of projects with margins of error greater than +25 percent. Table H-5 lists the projects that were reprogrammed and shows the original program, the reprogrammed, and the contract award amounts, as well as the percentage cost differential between the program amount and the most current certified construct award amount.

Table H-5.
Projects in the NAFMC Program Requiring Reprogramming by Congress

Fiscal year	Installation	Project	Amount ($000)			Cost differential (percent)
			Original program	Repro-grammed	Contract award	
1988	Leonard Wood	Youth center	1,750	2,293	2,290	30.86
1988	Sill	Auto craft	2,250	2,992	3,045	35.33
1988	Sill	Enlisted dining	1,100	1,770	1,829	66.27
1988	Meade	Bowling	1,050	1,885	1,571	49.62
1990	Page (Korea)	Multipurpose fields	650	1,025	619	– 4.77
1991	Lewis	Golf course	1,450	1,350	1,350	– 6.9
1991	Aliamanu	Youth activity center	1,650	2,360	2,360	43.03
1991	Meade	Golf course	1,850	2,150	2,150	16.22
1992	Knox	Pool	2,800	4,036	4,500	60.71
1993	Walker (Korea)[a]	Youth activity center	1,200	1,800	TBD	N/A

[a]The Walker project was sent to OSD for reprogramming on 14 March 1994; OSD had not forwarded it to Congress when this was written.

From FY87 through FY93, CFSC requested reprogramming for only 10 projects out of a total of 163, and only 8 of the projects needed an increase in the program amount. Eight projects out of a total of 163 represent about 5 percent of the total. Given the fluctuating nature of the construction market, having 5 percent of projects experience construction awards that exceed the 125 percent of program amount threshold is an excellent record for a project cost estimating system.